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THE FLORA OF AN HISTORIC WALL.

(With a special note of *Pellaea atropurpurea*.)

BY DONALD CULROSS PEATTIE.

On my way up to see Father Tondorf, the learned seismologist of Georgetown University, my eye was caught by a refreshing mass of green along the old retaining wall of the University's athletic field. I stopped and examined what it might be that made so brave a show in this dreary month and found it to be a fern exceedingly rare around Washington, the cliff brake, *Pellaea atropurpurea*. As I looked I became aware that the whole wall was alive with it. Most of the chinks and crannies, and there are many such in the oldest third of the quarter-of-a-mile wall, were filled with the fern. I should estimate the total number of this fern at three thousand individuals. The only other station in this region which I know is in the old city of Alexandria, Virginia.

The cliff brake is a favorite of those who know it on accounts of its beautiful purple stems and pale, leathery pinnae. I have found it on a sheer precipice of igneous rock at Chimney Rock, Rutherford County in mountainous North Carolina. It is more rarely associated with densely populated districts like Georgetown.

I have searched such standard books as I have at hand, and nowhere do I find mention of the fact that the cliff brake

is an evergreen fern. In this climate, at least, it would seem to be so, however. In winter condition I found it wholly green, although its pinnae had somewhat curled in, probably for protection after the manner of resurrection and lip ferns.

The newer two thirds of the wall, or at least what I believe to be the newer, are not retaining walls and hence have little earth in their chinks. The chinks, too, are much fewer, due to better masonry. For these reasons and because of the time element, there are far fewer of the cliff brakes on the new walls, although they are more abundant than any other of the plants I found there.

There is one other fern on the wall, *Woodsia obtusa*, which is common in this region but rare on the wall, just as the cliff brake is common on the wall but rare elsewhere in this vicinity. Poison-ivy of the climbing sort was plentiful, and among vines there was also trumpet-creeper, in pod, and star-cucumber. Probably only two species were deliberately planted; they were English ivy and *Parthenocissus tricuspidata* var. *Veitchii*.

Just as the old university with its ecclesiastical air and its chimes and great walls has about it something old-world, so the flora of that wall is also largely an old-world flora as is evidenced from the list of plants appended here.

There is a little of some *Carex* with thick ribbon-like leaves and a *Muehlenbergia* which was producing bulblets in the lower axils. There were fewer lichens and mosses than might have been expected, and none were in condition to identify.

I list the species or genera I was able to recognize in winter state.

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FEL

- Pellaea *atropurpurea*, Cluff Brake
Woodisia obtusa
*Chaetochloa sp. Foxtail
Muhlenbergia sp.
Carex sp.
*Rumex crispus, Curly Dock
*Polygonum convolvulus, Bindweed
Acalypha virginica, Three-seeded Mercury
Rhus radicans, Poison-Ivy
*Hibiscus syriacus, Althea, "Rose-of-Sharon"
*Parthenocissus tricuspidata var. Veitchii. Boston Ivy
Viola sp., Violet
*Hedera helix, English Ivy
*Paulownia imperialis, Princess Tree
Tecoma radicans, Trumpet Creeper
*Pantago lanceolata, English Plantain
*Lonicera japonica, Japanese Honeysuckle
Sicyos angulatus, Star Cucumber
Solidago spp., Golden Rod
Aster spp., Aster
Ambrosia trifida, Ragweed
Lactuca sp.
*Sonchus sp. Sow Thistle

* Denotes old-world species.

Donald Culross Peattie,
Lee Heights, Rosslyn,
Virginia.

FEB. 8, 1925

II. PTERIDOPHYTA.

N. M. GRIER.

(Continued from the January Issue)

OPHIOGLOSSACEAE.

Botrychium dissectum Spreng. Cut-leaved Grape-Fern or Moon Wort. Coppice, Jones Marsh, 1st, 2nd lakes. C.S.H.—G.H.H.

Botrychium obliquum Muhl. Ternate Grape-fern. Coppice. Jones Marsh. C.S.H.—N.M.G.

Botrychium virginianum L. Virginia Grape-fern. Jones' Woods, High Hill. C.S.H.—N.M.G.

OSMUNDACEAE.

Osmunda cinnamomea L. Cinnamon Fern. Moist woods, gardens, C.S.H.—N.M.G.

Osmunda claytoniana L. Clayton's Fern. Moist woods, C. S.H.—N.M.G.

Osmunda regalis L. Royal Fern. Coppice of Jones Marsh. C.S.H.—C.E.

POLYPODIACEAE.

Adiantum pedatum L. Maiden-hair or Lock-hair Fern. Moist, rich woods. C.S.H.—N.M.G.

Anchistea virginica (L) Presl. Virginia Chain Fern. C.S.H.—J.A.H.

Asplenium platyneuron Oakes... Ebony Spleenwort. De Forest Estate, C.S.H.—G.H.H.

Athyrium Filix-femina (L) Roth. Lady Fern. Woods near 1st lake—N.M.G.

Dennstaedtia punctiloba (Mich.) Moore. Hay Scented Fern. Moist woods, C.S.H.—N.M.G.

Dryopteris aristatum var. Clintoniana. Clinton's Fern. C. S.H.—N.M.G.

Dryopteris boottii (Tuckerm.) Underw. Boott's Shield Fern. Vicinity C. S. H.—J.A.H.

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- Dryopteris marginalis* L. Evergreen Wood Fern. Moist rich woods. C.S.H.—G.H.H.
- Dryopteris noveboracensis*. Sw. New York Fern. Woods near 1st lake.—N.M.G.
- Dryopteris Phegopteris* (L.) C. Chr. Long Beach Fern. C. S.H.—N.M.G.
- Dryopteris simulata*. Davenp. Dodge's Shield Fern. Vicinity C.S.H.—C.E.
- Dryopteris spinulosa*. (Muell.) Kuntze. Spinulose Shield Fern. C.S.H.—N.M.G.
- Dryopteris Thelypteris* L. W. Marsh Shield Fern. Near salt marsh, C.S.H.—N.M.G.
- Filix Fragilis* (L.) Underwood. Brittle Fern. C.S.H.—N.M.G.
- Lorinseria areolata* (L.) Prest. Net-veined Chain Fern. Between 1st and 2nd lakes, C.S.H.—G.H.H.
- Matteucia Struthiopteris* (L.) Todaro. Ostrich Fern. De Forest Estate, C.S.H.—N.M.G.
- Onoclea sensibilis* L. Sensitive Fern. Moist Localities. C. S.H.—N.M.G.
- Phyllitis scolopendrium* (L.) Newm. Hart's Tongue. De Forest Estate, C.S.H.—N.M.G.
- Polystichum acrostichoides* (Mch.) Schott. Christmas Fern. Rocky woods, C.S.H.—N.M.G.
- Polystichum lonchitis* L. Holly Fern. C.S.H.—N.M.G.
- Polypodium vulgare* L. Common or Golden Polypody. Rocky banks, C.S.H.—N.M.G.
- Pteridium aquilinum* (L.) Kuhn. Brake. Bracken. Pine barrens, St. James, L. I.; C.S.H.—N.M.G.

MARSILIEACEAE.

- Marsilea quadrifolia* L. European Marsilea or Pepper wort. Established at Fourth lake, and estates, C.S.H.—N.M.G.

SALVINIACEAE.

- Azolla caroliniana* Willd. Carolina Azolla. Estates vicinity, C.S.H.—N.M.G.

* In preparing this and following sections of the manuscript I am indebted for the aid of former students, Mrs. Christine Ruth Grier, Miss Gail Holliday, Miss Susan Green, Miss Emma Kemp, Miss Myrtle Waterfall.

Salvinia natans (L.) All. *Salvinia*. Floating Moss. Estates, vicinity C.S.H.—N.M.G.

EQUISETACEAE.

Equisetum arvense L. Field Horsetail. Marsh, C.S.H.—N.M.G.

LYCOPODIACEAE.

Lycopodium carolinianum L. Carolina Club-moss. L. Ronkonkema region, L. I. Ferguson (2).

Lycopodium complanatum L. Trailing Christmas-green. Ground-pine. Moist woods, C.S.H.—N.M.G.

Lycopodium inundatum L. Bog or Marsh Club-moss. C.S.H.—N.M.G.

Lycopodium lucidulum Michx. Shining Club-moss. Havemeyer Estate, near Oyster Bay—N.M.G.

Lycopodium obscurum L. Ground-pine. Havemeyer Estate, near Oyster Bay.—N.M.G.

SELAGINELLACEAE.

Selaginella apus (L) Creeping Selaginella. Fern Belt in Salt Marsh. C.S.H.—H.S.C.

ISOETACEAE.

Isoetes tuckermani A. Br. Tuckerman's Quillwort. Lake Ronkonkema, L. I.—N.M.G.

EMBRYOPHYTA SIPHONOGAMA. (SPERMATOPHYTA)

I. GYMNOSPERMAE.

PINACEAE.

Abies balsamea (L) Mill. Balsam Fir. Tiffany Estate, C.S.H.—G.H.H.

Abies Picea (L) Lindley. Norway Spruce. De Forest Estate, C.S.H.—N.M.G.

Chamaecyparis thyoides L. Southern White Cedar. Tiffany Estate, C.S.H.—N.M.G.

Juniperus communis L. Juniper. Eugenics Record office, C.S.H.—N.M.G.

Juniperus communis var. *depressa*. Eugenics Record office grounds, C.S.H.—N.M.G.

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Taxodium
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Juniperus virginiana L. Red Cedar. Near Eugenics Record office, C.S.H.—N.M.G.

Larix laricina Koch. American Larch. Near Cold Spring Harbor Village.—G.H.H.

Pinus rigida Mill. Pitch Pine. Woods near C.S.H.—N.M.G.

Pinus Strobus L. White Pine. Weymouth Pine. Moist woods, C.S.H.—N.M.G.

Taxodium distichum L. Bald Cypress. Matheson Estate, Lloyds Point, L. I.—N.M.G.

Thuja occidentalis L. Arbor Vitae. Tiffany Estate, C.S.H.—N.M.G.

Tsuga canadensis (L) Carr. Hemlock. Tiffany Estate, C.S. H.—N.M.G.

TAXACEAE.

Taxus canadensis. Marsh. American Yew. De Forest Cemetery. C.S.H.—N.M.G.

II. ANGIOSPERMAE.

MONOCOTYLEDONES.

TYPHACEAE.

Typha angustifolia L. Narrow-Leaved Cat-tail. Brackish marsh, C.S.H.—N.M.G.

Typha latifolia L. Broad-leaved Cat-tail. Fresh water marsh, C.S.H.—N.M.G.

SPARGANIACEAE.

Sparganium androcladum (Eng.) Morong. Branching Bur-Reed. C.S.H.—N.M.G.

Sparganium lucidum Fernald. Shining-fruited Bur-reed. Muddy shore 1st lake, C.S.H.—N.M.G.

Sparganium simplex. Huds. Simple-stemmed Bur-reed. Black-weed. Mud flats, 2nd lake, C.S.C.—N.M.G.

ZANICHELLIACEAE.

Potamogeton alpinus. Bubs. Northern Pondweed. C.S.H.—N.M.G.

Potamogeton crispus L. Pondweed. C.S.H.—N.M.G. Grout.

Potamogeton oakesianus, Oakes' Pondweed. C.S.H.—Jelliffe.

Potamogeton pusillus L. Small Pondweed. 2nd lake, C.S.H.—N.M.G.

Ruppia maritima L. Sea or Ditch-grass. West shore, C.S.H.
—N.M.G.

ZOSTERACEAE.

Zostera marina L. Eel-grass. Shores of C.S.H.—N.M.G.

SCHEUCHZERIACEAE.

Triglochin maritima L. Sea-side Arrow-grass. Marsh, C.S.H.—N.M.G.

ALISMACEAE.

Alisma subcordatum Raf. American Water plantain. Woodbury Bog, Woodbury, L. I.—G.H.H.

Sagittaria engelmanni J. Engelmann's Arrow-head. L. Ronkonkema. (Ferguson List.)

Sagittaria graminea Michx. Grass-leaved Sagittaria. C.S.H. vicinity—N.M.G.

Sagittaria latifolia Willd. Broad-leaved Arrow-head. C.S.H. vicinity.—J.A.H.

Sagittaria rigida Pursh. Sessile-fruited Arrow-head. Hodenpyl estate, Locust Valley, L. I.—N.M.G.

VALLISNERIACEAE.

Philotria canadensis (L) Mchx. Water-weed. 1st lake, C.S.H.—N.M.G.

GRAMINEAE.

Agropyron repens Beauv. Couch-grass. Roadside, Fish Hatchery, C.S.H.—N.M.G.

Agropyron sativum Lam. Dump, escaped from cultivation. C.S.H.—N.M.G.

Agrostis alba L. Red-top. Common C.S.H.—D.S.J.

Agrostis hyemalis B. S. P. Rough Hair-grass. Near railway station, C.S.H.—G.H.H.

Agrostis maritima Lam. Dense-flowered Bent-grass. North Thicket, Jones Marsh.—G.H.H.

Agrostis perennans (Walt.) Tuckerm. Upland Bent-grass. C.S.H.—J.A.H.

Alopecurus sp. L. Fox tail. Jones Marsh, C.S.H.—N.M.G.

Ammophila arenaria (L) Sea Sand-reed. Upper Beach, C.S.H.—N.M.G.

Andropogon furcatus Muhl. Forked Beard-grass. Hempstead Plains, Hicksville, L. I.—N.M.G.

- Andropogon virginicus* L. Virginia Beard-grass. C.S.H.
vicinity.—J.A.H.
- Anthoxanthum odoratum* L. Sweet Vernal-grass. Near Black-
ford Hall, C.S.H.—G.H.H.
- Aristida tuberculosa* Nutt. Sea-beach Triple-awned Grass.
C.S.H.—Ferguson (2) J.A.H.
- Arrhenatherum elatius* (L) Beauv. Oat-grass. C.S.H.—J.
A.H.
- Avena sativa* Linn. Oats. Dump, C.S.H.—N.M.G.
- Bromus nordeaceus* L. Soft Chess. C.S.H. vicinity—J.A.H.
- Bromus racemosus* L. Upright Chess. C.S.H. vicinity.—J.
A.H.
- Bromus tectorum* L. Downy Brome-grass. C.S.H.—J.A.H.
- Calamagrostis canadensis*, Beauv. Blue-joint Grass. Lake
Ronkonkema, L. I.—G.H.H.
- Capriola Dactylon*, Pers. Bermuda-grass. Jones Marsh, C.
S.H.—C.E.
- Cenchrus tribuloides* L. Bur-grass. C.S.H.—N.M.G.
- Chaetochloa glauca* (L) Scrib. Yellow Foxtail. Common
C.S.H.—G.H.H.
- Chaetochloa viridis* (L) N. Green Foxtail-grass. C.S.H.
vicinity.—J.A.H.
- Cinna arundinacea* L. Sweet Reed-grass. C.S.H.—N.M.G.
- Dactylis glomerata* L. Orchard-grass. Cock's foot. Lab.
grounds, C.S.H.—C.E.
- Danthonia spicata*, Beauv. Common Wild Oat-grass. Hills
above lakes. C.S.H.—N.M.G.
- Deschampsia flexuosa* (L) Trin. Wavy Hair-grass. Hills
above lakes. C.S.H.—G.H.H.
- Diplachne fascicularis* Beauv. Clustered Salt-grass. C.S.H.
—N.M.G.
- Distichlis spicata*, Greene. Marsh Spike-grass. Salt Marsh.
C.S.H.—N.M.G.
- Echinochloa Crus-galli*, Beauv. Barnyard-grass. Hicksville
near depot.—G.H.H.
- Eleusine indica* (L) Gaertner. Wire-Grass. C.S.H. vicinity.—
D.S.J.
- Elymus virginicus* L. Sandspit. Terrell-grass. G.S.H.
- Eragrostis Eragrostis* (L) Karst. Love-grass. Sandspit, C.
S.H. vicinity.—J.A.H.

- Eragrostis pectinacea* Steud. Purple Love-grass. Near Railroad Station, C.S.H.—G.H.H.
- Eragrostis pilosa* Beauv. Small Tufted Love-grass. Salt Marsh, C.S.H.—G.H.H.
- Festuca elatior* L. Tall or Meadow Fescue-grass. C.S.H. Roadsides.—G.H.H.
- Festuca ovina* L. Sheep's Fescue-grass. C.S.H. vicinity. —G.H.H.
- Homalocenchrus oryzoides* (L) Rice Cut-grass. C.S.H. vicinity.—J.A.H.
- Homalocenchrus virginicus* (Willd.) Britton. White Grass. Jones Marsh, C.S.H.—C.E.
- Lolium perenne* L. Ray-grass. Near Catholic church, Huntington.—G.H.H.
- Muhlenbergia mexicana* (L) Trin. Satin-grass. C.S.H.—J. A.H.
- Nothoholcus lanatus* (L) Nash. Velvet-grass. Meadow or Woolly Soft-grass. Pastures, C.S.H. vicinity.—G.H.H.
- Panicularia canadensis* (Michx) Kuntze. 1st lake north of St. John's church. C.S.H.—G.H.H.
- Panicularia nervata* (Willd) Kuntze. Meadow-grass. C.S.H.—J.A.H.
- Panicum Boscii* Poir. Bosc's Panic-grass. C.S.H. vicinity—Jelliffe.
- Panicum capillare* L. Witch-grass. R. R. west of depot, C. S.H.—H.
- Panicum clandestinum* L. Corn Grass. R. R. west of depot and Jones Marsh. C.S.H.—G.H.H.
- Panicum depauperatum* L. Starved Panic-grass.—C.S.H.—J.A.H.
- Panicum dichotomum* L. Forked Panic-grass. R. R. west of depot. C.S.H.—G.H.H.
- Panicum linearifolium* Scrib. Low White-haired Panic-grass. C.S.H.—J.A.H.
- Panicum meridionale* Ashe. Matting Panic-grass. Salt Marsh, C.S.H.—G.H.H.
- Panicum microcarpon* Muhl. Barbed Panic-grass. R. R. west of depot. C.S.H.—G.H.H.
- Panicum tennesseense* Ashe. Tennessee Panic-grass. C.S.H. vicinity.—J.A.H.

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- Panicum virgatum* L. Switch-grass, Wild Red-Top. C.S.H.
vicinity.—N.M.G.
Panicum wilcoxianum Wilcox's Panic-grass. C.S.H. vicinity.
—N.M.G.
Phalaris Canariensis L. Canary or Bird-seed-grass. Waste
places. C.S.H.—N.M.G.
Phleum pratense L. Timothy. Herd's grass. Laboratory
grounds, C.S.H.—N.M.G.
Phragmites Phragmites Karst, Read. Common Reed-grass.
Gilgo Beach, L. I.; Jones Marsh, C.S.H.—N.M.G.
Poa annua (L) Dwarf Meadow-grass. Low spear-grass, C.
S.H.—J.A.H.
Poa compressa L. Wire-grass. Sandspit, Roadsides, C.S.H.—
N.M.G.
Poa pratensis L. Kentucky Blue-grass. Fields, Cold Spring
Harbor, C.S.H.—N.M.G.
Savastana odorata (L) Scrib. Holy Grass Seneca-grass,
C.S.H.—Jelliffe.
Schizachyrium scoparium (Michx) Nash. Broom Beard-grass.
Hempstead Plains, Hicksville, L. I.—N.M.G.
Sorghastrum nutans (L) Nash. Indian-grass. C.S.H.—N.
M.G.
Spartina cynosuroides Marsh. Salt Reed-grass. Lloyd's
Point, C.S.H.—N.M.G.
Spartina patens Muhl. Salt-meadow grass. Salt Marsh, C.
S.H.—N.M.G.
Spartina stricta (Ait) Roth. Salt Marsh-grass. Salt Marsh,
C.S.H.—N.M.G.
Sporobolus asper Kunth. Long-leaved Rush-grass. Roadside
on Sea Beach, C.S.H.—G.H.H.
Syntherisma sanguinalis (L) Dulac. Large Crab-grass. Fin-
ger grass.—N.M.G.
Tridens flavus L. Hitchc. Tall Red-top. R. R. West of depot,
C.S.H.—G.H.H.
Zea Mays, Linn. Escaped from Cultivation, C.S.H.—N.M.G.

CYPERACEAE.

- Carex abscondita* Mackenzie, Thicket Sedge Ferguson (2),
C.S.H.—J. A. Ferguson.

- Carex Asa Grayi* Bailey. Gray's Sedge, C.S.H. vicinity.—J.A.H.
- Carex canescens* L. Silvery or Hoary Sedge, C.S.H.—J.A.H.
- Carex cephalophora* Muhl. Oval-headed Sedge, C.S.H.—J.A.H.
- Carex crinita* Lam. Fringed Sedge. Sickle Grass. C.S.H.—Jelliffe.
- Carex digitalis* Willd. Slender Wood Sedge, C.S.H.—J.A.H.
- Carex flexuosa* Muhl. Slender-stalked Sedge. Vicinity C.S.H.—J.A.H.
- Carex folliculata* L. Long Sedge C.S.H.—N.M.G.
- Carex gynandra* Schwein. Nodding Sedge. C.S.H.—J.A.H.
- Carex hormathodes* Fernald. Marsh Straw Sedge. Fresh and Brackish marshes, C.S.H.—Jelliffe.
- Carex Hystricins.* S. Porcupine Sedge. Bog, C.S.H.—G.H.H.
- Carex interior* Bailey. Inland Sedge. C.S.H.—J.A.H.
- Carex intumescens* Rudge. Bladder Sedge, C.S.H.—G.H.H.
- Carex laxiflora* Lam. Loose-flowered Sedge. Vicinity, C.S.H.—J.A.H.
- Carex lurida* Wohl. Sallow Sedge. Vicinity, C.S.H.—J.A.H.
- Carex pennsylvanica* Lam. Pennsylvania Sedge. Vicinity, C.S.H.—J.A.H.
- Carex rosea* Schk. Stellate Sedge. Vicinity C.S.H.—J.A.H.
- Carex scabriata* Schw. Rough Sedge. Vicinity C.S.H.—J.A.H.
- Carex scoparia canadensis* Fernald. Pointed Broom Sedge. Vicinity, C.S.H.—J.A.H.
- Carex sterilis* Willd. Inland Sedge. C.S.H.—G.H.H.
- Carex stipata* Muhl. Awl-fruited Sedge. Vicinity C.S.H.—J.A.H.
- Carex straminea* Willd. Straw Sedge. Dog-grass. Vicinity C.S.H.—Jelliffe.
- Carex stricta* Lam. Tussock Sedge. Vicinity C.S.H.—C.E.
- Carex ternuliflora* Wahl. Sparse-flowered Sedge. Vicinity C.S.H.—N.M.G.
- Carex tribuloides* Wahl. Blunt Broom Sedge. Vicinity, C.S.H.—J.A.H.
- Carex virescens* Muhl. Ribbed Sedge, C.S.H.—J.A.H.
- Carex vulpinoidea* Mchx. Fox Sedge. Jones Marsh, C.S.H.—C.E.
- Cyperus diandrus* Torr. Low Cyperus. Vicinity, C.S.H.—J.A.H.

- Cyperus erythrorrhizus* (L) Muhl. Red-rooted Cyperus.
Edge Salt marsh, C.S.H.—N.M.G.
- Cyperus filiculmos*. Vahl. Slender Cyperus. Sand spit, ice
house site, C.S.H.—N.M.G.
- Cyperus flavescens* L. Yellow Cyperus. Kettle Hole, near L.
Ronkonkema, L. I.—N.M.G.
- Cyperus Grayi* Torr. Gray's Cyperus. Vicinity, C.S.H.—J.
A.H.
- Cyperus speciosus* Vahl. Michaux's Cyperus. Vicinity, C.S.H.
J.A.H.
- Cyperus strigosus* L. Straw-colored Cyperus. Salt Marsh,
C.S.H.—G.H.H.
- Dulichium arundinaceum* (L) Britt. Glen Cove. L. I.—
Jelliffe.
- Eleocharis acicularis* (L) R. and S. Needle, or Least, Spike-
rush. Vicinity, C.S.H.—J.A.H.
- Eleocharis melanocarpa* Torr. Black fruited spike-rush,—
N.M.G.
- Eleocharis olivacea* Torr. Bright Green Spike-rush. Salt
Marsh, C.S.H.—N.M.G.
- Eleocharis palustris* (K) Roem and Schult. Creeping Spike-
rush. Glen Cove.—Jelliffe.
- Eleocharis rostellata* Torr. Beaked Spike-rush. Salt Marsh,
C.S.H.—C.E.
- Eleocharis tenuis* (Willd.) Schultes. Slender Spike-rush. N.
W. Thicket, Jones' Marsh, C.S.H.—C.E.
- Eriophorum tenellum* Nutt. Rough Cotton-grass. L. Ronkon-
kema.—N.M.G.
- Eriophorum* sp. Marsh at head of L. Ronkonkema.—N.M.G.
- Eriophorum virginicum* L. Virginia Cotton-grass, C.S.H.
vicinity.—Jelliffe.
- Fimbristylis autumnalis* (L) Roem and Schult. Slender Fim-
bristylis, Glen Cove.—Jelliffe.
- Rynchospora alba*. Vahl. White Beaked-rush Marsh. At head
of L. Ronkonkema.—N.M.G.
- Rynchospora glomerata* Vahl. Clustered Beaked-rush. Marsh
at head of L. Ronkonkema.—G.H.H.
- Scirpus americanus*. Pers. Three-square, Foot of bank, Salt
marsh, C.S.H.—N.M.G.

- Scirpus atrovirens* Muhl. Dark-green Bulrush. Glen Cove,
—D.S.
- Scirpus cyperinus* (L) Kunth. Wool-grass. Jones Marsh, N.
W. Thicket—C.E.
- Scirpus nanus* Spring. Salt marsh, C.S.H.—N.M.G.
- Scirpus paludosus* A. Nelson. Prairie Bulrush. Vicinity, C.S.
H.—J.A.H.
- Scirpus polyphyllus* Vahl. Leafy Bulrush, C.S.H.—Jelliffe.
- Scirpus robustus* Pursh. Salt Marsh Bulrush. Jones Salt
Marsh, C.S.H.—N.M.G.
- Scirpus subterminalis* Torr. Water Club-rush, C.S.H.—Jel-
liffe.
- Scirpus sylvaticus* L. Wood Bulrush or Clubrush.—G.H.H.
- Scirpus validus* Vahl. American Great Bulrush. Mat-rush.
Glen Cove.—Jelliffe.
- Scleria pauciflora* Muhl. var. *caroliniana*. Papillose Nut-
rush. Hempstead Plains, Hicksville.—G.H.H.
- Scleria triglomerata*. Michx. Tall Nut-rush. Hempsted
Plain, Hicksville.—G.H.H.
- Stenophyllum capillaris*, Brit. Hair-like Stenophyllum. Hill
west of R. R. depot, C.S.H.—G.H.H.

ARACEAE.

- Acorus Calamus* L. Sweet Flag. Jones Marsh, C.S.H.—N.
M.G.
- Arisaema triphyllum* (L) Schott. Jack-in-the-pulpit. Jones
woods, C.S.H.—N.M.G.
- Spathyema foetida* (L) Raf. Skunk cabbage. Bog. 1st. lake,
C.S.H.—N.M.G.

LEMNACEAE.

- Lemna minor* L. Lesser Duck-weed—Jelliffe.
- Spirodela polyrhiza* (L) Schleid. Greater Duckweed, 2nd lake.
Cold Spring Harbor.—Jelliffe.

XYRIDACEAE.

- Xyris caroliniana* Small. Carolina Yellow-eyed Grass. Kettle
hole near Lake Ronkonkema, L. I.—N.M.G.
- Xyris flexuosa* Muhl. Slender Yellow-eyed Grass. Vicinity
C.S.H.—N.M.G.

ERIOCAULACEAE

- Eriocaulon septangulare* With. Seven-angled Pipewort. L.
Ronkonkema, Mineola, L. I.—N.M.G.

COMMELINACEAE.

Commelina communis L. Asiatic Day-flower. Roadsides C.S.
H.—N.M.G.

Commelina virginica L. Virginia Day-flower. C.S.H.—N.
M.G.

PONTEDERIACEAE.

Pontederia cordata L. Pickerel-weed. L. Ronkonkema, L. I.
—N.M.G.

JUNCACEAE.

Juncoides carolinae (S. Wats.) Kuntze. Hairy Wood-rush.—
Jelliffe.

Juncoides campestre (L) Kuntze. Common Wood-rush. Vicinity, C.S.H.—J.A.H.

Juncus acuminatus Mx. Sharp-fruited Rush. Vicinity, C.S.
H.—J.A.H.

Juncus brachycephalus Buch. Small-headed Rush. Vicinity
C.S.H.—G.H.H.

Juncus bufonius L. Toad Rush. Vicinity C.S.H.—J.A.H.

Juncus canadensis Gay. Canada Rush. Salt Marsh, C.S.H.—
N.M.G.

Juncus effusus L. Common Rush. Vicinity C.S.H.—N.M.G.

Juncus Gerardi Loisel. Black-grass. Salt Marsh, C.S.H.—
N.M.G.

Juncus Greenei Oakes and Tuckermann. Greene's Rush.
Hempstead Plains, L. I.—N.M.G.

Juncus tenuis Willd. Slender Rush. Yard Rush. Hempstead
Plains.—N.M.G.

MELANTHACEAE.

Chamaelerium sp. C.S.H.—G.H.H.

Chroosperma sp. C.S.H.—G.H.H.

Melanthium latifolium Lorr. Crisped Bunch-flower.—N.M.G.

LILIACEAE.

Aletris farinosa L. Star-grass Ague. Hempstead Plain,
Hicksville.—N.M.G.

Allium canadense L. Meadow Garlic.—Jelliffe.

Allium tricoccum Ait. Wild Leek. C.S.H., on roadsides.
—N.M.G.

Allium vineale L. Wild Garlic. C.S.H., on roadsides.—N.M.G.

Hemerocallis fulva L. Day Lily. Roadsides, C.S.H.—N.M.G.

Lilium canadense L. Wild Yellow Lily.—Jelliffe.

- Lilium philadelphicum* L. Wood Lily. Pine Barrens near St. James, L. I.—N.M.G.
- Lilium superbum* L. Turk's Cap Lily. Hodenpyl Estate, Locust Valley, L. I.—N.M.G.
- Lilium tigrinum* Ker. Tiger Lily. Roadsides, C.S.H.—N.M.G.
- Muscari botryoides* (L) Hill. Grape Hyacinth. C.S.H. vicinity.—J.A.H.
- Ornithogalum umbellatum* L. Star-of-Bethlehem. Summer Snow-flake, Star-Flower.—N.M.G.
- Veratrum viride* Ait. American White Hellebore. Vicinity of lakes, C.S.H.—N.M.G.
- Yucca filamentosa* L. Adam's Needle. DeForest Estate, C. S.H., Fish Hatchery.—N.M.G.

CONVALLARIACEAE.

- Asparagus officinalis* L. Asparagus. C.S.H., vicinity. sandspit —N.M.G.
- Polygonatum biflorum* Ell. Hairy Solomon's Seal. Jones' Woods, near 1st lake, C.S.H.—N.M.G.
- Polygonatum commutatum*. (Wait) Ell. Smooth Solomon's Seal, C.S.H.—J.A.H.
- Vagnera racemosa* (L) Wild Spikenard. Woods, vicinity C. S.H.—N.M.G.
- Vagnera stellata* (L) Morong. Star-flowered Solomon's Seal. C.S.H.—Jelliffe.
- Unifolium canadense* (Desf.) Greene. False Lily-of-the-Valley. Woods near 1st lake.—G.H.H.
- Uvularia perfoliata* L. Perfoliate Bellwort. Vicinity C.S.H.—Jelliffe.
- Uvularia sessifolia* L. Sessile-leaved Bellwort. Vicinity C. S. H.—J.A.H.

TRILLIACEAE.

- Medeola virginiana* L. Indian Cucumber-root. Hill above 1st lake, C.S.H.—N.M.G.
- Trillium erectum* L. Ill-scented Wake-robin. Glen Cove.—Jelliffe.
- Trillium undulatum* Willd. Painted Wake-robin. Glen Cove.—Jelliffe.
- Trillium cernuum* L. Nodding Wake-robin. Vicinity C.S.H.—N.M.G.

Trillium grandiflorum (Michx) Salisb. Large-flowered Wake-robin.—N.M.G.

SMILACEAE.

Smilax glauca L. Glaucous-leaved Greenbrier. Woods, C.S.H.—G.H.H.

Smilax herbacea L. Carrion-flower. Woods. Vicinity C.S.H.—Jelliffe.

Smilax rotundifolia L. Greenbrier. Woods. Vicinity, C.S.H.—N.M.G.

AMARYLLIDACEAE.

Hypoxis hisuta (L) Coville Yellow Star-grass. Hempstead Plains near Hicksville—N.M.G.

IRIDACEAE.

Gladiolus sp. Jones' Marsh.—C.E.

Iris prismatica Pursh. Narrow Blue-flag. C.S.H.—N.M.G.

Iris versicolor L. Larger Blue-flag. Salt Marsh, C.S.H.—N.M.G.

Sisyrinchium angustifolium Muhl. Pointed Blue-eyed Grass.—Jelliffe.

Sisyrinchium graminoides. Mull. Stout Blue-eyed Grass. Vicinity C.S.H.—J.A.H.

ORCHIDACEAE.

Arethusa bulbosa L. Dragon's Mouth. Oyster Bay.—Jelliffe.

Blephariglottis ciliaris L. Rydb. Yellow-fringed Orchis. Hempstead Plains, Hicksville, L.I.—Jelliffe.

Blephariglottis lacera (Michx.) R. Br. Ragged or Green-fringed Orchis. Moist woods, 1st lake, C.S.H.—N.M.G.

Blephariglottis psycodes (L) Rydb. Smaller purple-fringed Orchis. Oyster Bay.—Jelliffe.

Corallorrhiza maculata Raf. Large Coral-root.—Jelliffe.

Fissipes acaulis (Ait.) Small. Moccasin Flower Stemless Ladies'-Slipper. Bayville Woods about lakes.—N.M.G.

Gymnadeniopsis clavellata (Michx.) Rydb. Small Green Wood Orchis. Sphagnum Bog, West Side 3rd Lake, C.S.H.—D.S.J.

Ibidium Beckii (Lindl) House. Little Ladies' Tresses, C.S.H.—J.A.H.

Ibidium cernuum (L) House. Nodding or Drooping Ladies' Tresses, C.S.H.—D.S.J.

- Ibidium gracile* (Bigel) House. Slender Ladies' Tresses, C. S.H.—J.A.H.
- Ibidium plantagineum* (Raf.) House. Wide-leaved Ladies' Tresses. C.S.H.—D.S.J.
- Ibidium praecox* (Walt.) House. Grass-leaved Ladies' Tresses C.S.H.—D.S.J.
- Limodorum Tuberosum* L. Frequent Grass-pink. Calopogon. C.S.H.—D.S.J.
- Liparis liliifolia* (L) L. C. Rich. Large Twayblade. C.S.H.—D.S.J.
- Malaxis unifolia* Michx. Green Adder's-Mouth, C.S.H., Oyster Bay—Jelliffe.
- Perarium ophioides* (Fernald) Rydb. Lesser Rattlesnake Plantain. Vicinity, C.S.H.—N.M.G.
- Perarium pubescens* (Willd.) Macm. Downy Rattlesnake Plantain. Moist woods near 2nd lake, C.S.H.—N.M.G.
- Perularia flava* (L.) Farwell. Tuberled Orchis. Small Pale-Green Orchis, Glen Cove.—Jelliffe.

DICOTYLEDONES.

SAURURACEAE.

- Saururus cernuus* L. Lizard's Tail. Glen Cove—Jelliffe.

JUGLANDACEAE.

- Hicoria alba* L. Roadsides. White-heart Hickory. Eugenics Record Office grounds, C.S.H.—N.M.G.
- Hicoria glabra* Spach. Pig-nut Hickory. Thicket in Jones Marsh, C.S.H.—N.M.G.
- Juglans cencrea* L. Butternut. Roadsides. C.S.H.—N.M.G.
- Juglans nigra* L. Black Walnut. Roadsides, C.S.H.—N.M.G.

MYRICACEAE.

- Comptonia peregrina* (L) Coulter. Sweet Fern. C.S.H. vicinity.—N.M.G.
- Myrica carolinensis* Mill. Bayberry. De Forest Cemetery. C. S.H.—N.M.G.
- Myrica cerifera* L. Wax myrtle, C.S.H. vicinity.—N.M.G.
- Myrica Gale* L. Sweet Gale. C.S.H. vicinity.—N.M.G.

SALICACEAE.

- Populus alba* L. Aspen. Roadsides, C.S.H.—N.M.G.
- Populus balsamifera* L. Carolina Poplar. Vicinity, C.S.H.—N.M.G.

- Populus candicans* Ait. Balm of Gilead, C.S.H. vicinity.—
N.M.G.
- Populus grandidentata* L. Large-toothed Aspen. Pine Barrens,
L.I. Vicinity C.S.H.—N.M.G.
- Populus heterophylla* L. Swamp Poplar, C.S.H. vicinity.—
Jelliffe.
- Populus italica* Moench. Lombardy Poplar, C.S.H. vicinity.
—Jelliffe.
- Populus tremuloides* Mchx. Quiver-leaf, C.S.H. vicinity.—
Jelliffe.
- Salix alba* L. White Willow. Along streams and roadsides.
C.S.H.—N.M.G.
- Salix babylonica* L. Weeping Willow. Near streams, De
Forest Estate. C.S.H.—N.M.G.
- Salix discolor* Muhl. Pussy Willow, C.S.H. vicinity.—N.M.G.
- Salix fragilis* L. Crack Willow. C. S.H. vicinity.—N.M.G.
- Salix humilis* Marsh. Prairie Willow, Hempstead Plain. C.
S.H.—N.M.G.
- Salix lucida* Muhl. Shining Willow. C.S.H. vicinity.—J.H.H.
- Salix petiolaris* J. E. Smith. Slender Willow. C.S.H. vicinity
—J.H.H.
- Salix purpurea* L. Purple Willow. C.S.H. vicinity.—J.H.H.

BETULACEAE.

- Alnus incana* (L) Moench. Hoary Alder. E. shore C.S.H.—
D.S.J.
- Alnus rugosa* Spreng. Hazel Alder. Road near fish hatchery.
C.S.H.—N.M.G.
- Betula lenta* L. Cherry Birch. Moist woods, C.S.H.—N.M.G.
- Betula lutea* Michx. Yellow Birch. Woods near 2nd lake,
Fish hatchery Road, C.S.H.—N.M.G.
- Betula nigra*. L. Red Birch. Oyster Bay.—D.S.J.
- Betula populifolia* Marsh. American White Birch. Road to
Eugenics Record Office.—N.M.G.
- Carpinus caroliniana* Walt. American Hornbeam. Vicinity
1st and 2nd lakes, C.S.H.—N.M.G.
- Corylus americana* Walt. Hazel-nut. Near 1st lake, C.S.H
—N.M.G.
- Ostrya virginiana* (Hill) Willd. Iron-wood. C.S.H. vicinity.
—G.H.H.

FAGACEAE.

- Castanea dentata* (Marsh) Borkh. American Chestnut. C. S.H. vicinity. Saplings only.—N.M.G.
- Fagus grandifolia* Ehrb. American Beech. Grounds Eugenics Record Office, C.S.H.—N.M.G.
- Quercus alba* L. White Oak. Vicinity lakes. C.S.H.—N.M.G.
- Quercus coccinea* Wang. Scarlet Oak. Huntington Rd., C.S. H.—N.M.G.
- Quercus ellipsoidalis* Hill. Hill's Oak. Bayville near dunes.—N.M.G.
- Quercus ilicifolia* Wang. Scrub Oak. Pine Barrens, St. James, L. I.—N.M.G.
- Quercus imbricaria* Mich. Shingle Oak. Hodenpyl Estate, Locust Valley, L. I.—N.M.G.
- Quercus marilandica* Muench. Barren Oak. Bayville, L. I., on dunes.—N.M.G.
- Quercus Muhlénbergii* Engelm. Chestnut Oak. Locust Valley, Glen Cove, Oyster Bay.—Jelliffe.
- Quercus nigra* L. Black-jack Oak. Oyster Bay.—Jelliffe.
- Quercus palustris* Muench. Pin Oak. Lloyd Point, C.S.H.—N.M.G.
- Quercus Phellos* L. Willow Oak. Matheson Estate, Lloyd Point, C.S.H.—N.M.G.
- Quercus prinoides* Willd. Scrub Chestnut Oak. Hempstead Plain, C.S.H. vicinity, Hicksville, L. I.—N.M.G.
- Quercus Prinus* L. Rock Chestnut Oak. 1st and 2nd lakes. C.S.H.—N.M.G.
- Quercus rubra* L. Red Oak. 1st and 2nd lakes. C.S.H.—N.M.G.
- Quercus stellata* Wang. Post Oak. Hempstead Plains, Hicksville, Oyster Bay.—H.S.C.
- Quercus velutina* Lam. Black Oak, C.S.H. vicinity.—N.M.G.

ULMACEAE.

- Celtis occidentalis* L. Hackberry, C.S.H. vicinity.—N.M.G.
- Ulmus alata* Michx. Winged Elm. Hodenpyl Estate, Locust Valley, L. I.—N.M.G.
- Ulmus americana* L. American Elm. Roadsides, C.S.H. vicinity.—N.M.G.
- Ulmus campestris* L. English Elm. C.S.H. vicinity.—N.M.G.

Ulmus

Glen

*Morus**Morus*

N.M.

Papyrifera

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*Canna**Humul**Boehm*

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Ulmus fulva Mchx. Slippery Elm. Jones woods, C.S.H.,
Glen Cove, Oyster Bay.—Jelliffe.

MORACEAE.

Morus alba L. White Mulberry, Glen Cove.—Jelliffe.
Morus rubra (L.) Red Mulberry. Davenport estate, C.S.H.—
N.M.G.

Papyrius papyrifera (L.) Kuntze. Paper Mulberry. Fish
Hatchery, C.S.H.—N.M.G.

CANNABINACEAE.

Cannabis sativa L. Hemp. C.S.H. vicinity.—G.H.H.
Humulus Lupulus L. Hop. C.S.H. vicinity.—N.M.G.

URTICACEAE.

Boehmeria cylindrica (L.) Sw. False Nettle. C.S.H. vicinity.
—N.M.G.

Pilea pumila (L.) A. Gray. Clear weed, C.S.H. village near
water and on sidewalks.—G.H.H.

Urtica dioica L. Stinging Nettle, C.S.H. vicinity.—N.M.G.

Urtica gracilis Ait. Slender Nettle. C.S.H. vicinity.—N.M.G.
Urticastrum divaricatum (L.) Kuntze. Wood Nettle.—Jelliffe.

SANTALACEAE.

Comandra umbellata (L.) Bastard Toad-flax, Hempstead
Plain, Hicksville.—N.M.G.

ARISTOLOCHIACEAE.

Aristolochia macrophylla Lam. Dutchman's Pipe. On barn
near Carnegie buildings, C.S.H.—N.M.G.

Aristolochia Serpentaria L. Virginia Snakeroot. Glen Cove.
—Jelliffe.

Asarum canadense L. Indian Ginger. Havemeyer Estate, C.
S.H. vicinity.—N.M.G.

Hexastylis virginica (L.) Small. Virginia Hexastylis. Have-
meyer Estate, C.S.H. vicinity.—G.H.H.

POLYGONACEAE.

Fagopyrum Fagopyrum (L.) Karst. Buckwheat, C.S.H. vicin-
ity.—Jelliffe.

Persicaria amphibia (L.) S. F. Gray. Water Persicaria,
Oyster Bay, C.S.H. vicinity.—Jelliffe.

Persicaria Carey (Olney) Green. Carey's Persicaria. Swamp
near L. Ronkonkema.—N.M.G.

- Persicaria hydropiper* L. (Opiz) Water Pepper. C.S.H. vicinity.—J.A.H.
- Persicaria hydropiperoides* Mchx. Mild Water Pepper. C.S.H. vicinity—Jelliffe.
- Persicaria lapathifolia* (L) S. F. Gray. Dock-leaved Persicaria. West Shore, C.S.H.—Jelliffe.
- Persicaria orientalis* (L) Spach. Prince's Feather. Roadsides, C.S.H.—N.M.G.
- Persicaria pennsylvanica*. Small. Pennsylvania Persicaria. Near R. R. depot, C.S.H.—G.H.H.
- Persicaria Persicaria* L. Lady's Thumb. C.S.H., Moist ground.—N.M.G.
- Persicaria punctata* (Ell.) Small. Water Smart Weed. Damp soil near Eugenics Record Office.—C.E.
- Persicaria punctata* var. *leptostachyum* Meisn. Water Smartweed. C.S.H., Lake marsh.—N.M.G.
- Pleuropteris Zuccarinii* Small. Japanese Knotweed. C.S.H. vicinity.—Jelliffe.
- Polygonella articulatum* L. Coast Jointweed. C.S.H. vicinity.—N.M.G.
- Polygonum arifolium* L. Halberd-leaved Tear-thumb. C.S.H., 1st lake shore.—N.M.G.
- Polygonum aviculare* L. Knotgrass. Waste places, vicinity C.S.H.—N.M.G.
- Polygonum erectum* L. Erect Knotweed. C.S.H. vicinity.—J.A.H.
- Polygonum maritimum* L. Seaside Knotweed. Salt Marsh, C.S.H.—H.S.C.
- Polygonum tenue* Michx. Slender Knotweed. Oyster Bay, C.S.H. vicinity.—Jelliffe.
- Rumex acetosella* L. Sheep Sorrell. Fields, C.S.H.—N.M.G.
- Rumex Brittainca* L. Great Water-Dock. Swamp, C.S.H.—G.H.H.
- Rumex crispua* L. Curled Dock. Roadsides, C.S.H.—N.M.G.
- Rumex obtusifolius* L. Bitter Dock. Roadsides, C.S.H.—N.M.G.
- Tinctoria Convolvulus*. (L) Webb and Mog. Black Bind Weed. C.S.H. vicinity.—J.A.H.
- Tovara virginiana*, Raf. Virginia Knotweed. Jones Marsh, C.S.H.—C.E.

Tracaulon sagittatum (L) Small. Arrow-leaved Tear-thumb.
Salt Marsh and Jones Woods, C.S.H.—C.E.

AMARANTHACEAE.

Amaranthus graecizans L. Tumbleweed. Common. C.S.H.—
G.H.H.

Amaranthus pumilis Raf. Coast Amaranth.—Jelliffe.
Amaranthus retroflexus L. Green Amaranth. Common, C.
S.H.—N.M.G.

CHENOPodiACEAE.

Atriplex arenaria Nutt. Sea-beach Atriplex. Sand Spit, C.
S.H.—N.M.G.

Atriplex hastata L. Halberd-leaved Orache. Salt Marsh, C.
S.H.—N.M.G.

Chenopodium album L. Lamb's Quarters. Roadsides, C.S.
H.—N.M.G.

Chenopodium ambrosioides L. Mexican Tea. Dump, Carne-
gie Inst., C.S.H.—N.M.G.

Chenopodium Bonus-Henricus L. Good King Henry. Glen
Cove.—Jelliffe.

Chenopodium boscianum Moq. Bosc's Goose-foot. C.S.H.
vicinity.—G.H.H.

Chenopodium urbicum L. Upright Goosefoot. Oyster Bay.—
Jelliffe.

Chenopodium murale L. Nettle-leaved Goosefoot. Oyster Bay.
—Jelliffe.

Dondia linearis (Ell.) Heller. Tall Sea-Blite.—N.M.G.

Dondia maritima L. Druce, Low Sea-Blite. Salt Marsh, C.
S.H.—N.M.G.

Rouibia multifida (L) Moq. Cut-leaved Goosefoot. C.S.H.
—N.M.G.

Salicornia ambigua Michx. Woody Glasswort. Salt Marshes,
C.S.H.—N.M.G.

Salicornia Bigelovii Torn. Bigelow's Glasswort. Sand Spit,
C.S.H.—Jelliffe.

Salicornia europea L. Jointed Glasswort. Salt marsh, C.S.
H.—N.M.G.

Salsola Kali L. Saltwort. Sandy beaches, C.S.H.—N.M.G.

PHYTOLACCACEAE.

Phytolacca Americana L. Poke. Common. C.S.H. vicinity.
—N.M.G.

CORRIGOLACEAE.

Anychia canadensis (L) B.S.P. Slender Forked Chickweed.
C.S.H., Oyster Bay.—Jelliffe.

AIZOACEAE.

Mollugo verticillata L. Carpet-weed. Sandspit, C.S.H.;
Matheson's Estate, Lloyd Neck, L. I.—N.M.G.
Sesuvium maritimum (Walt.) B.S.P. Sea Purslane, C.S.H.
—N.M.G.

PORTULACACEAE.

Claytonia virginica L. Spring Beauty. C.S.H. vicinity. —
J.B.W.

Portulaca grandiflora Lindl. Garden Portulaca. Cultivated,
C.S.H. vicinity.—N.M.G.

Portulaca oleracea L. Purslane. Fields and waste places, C.
S.H.—N.M.G.

Portulaca pilosa L. Hairy Portulaca. Gilgo Beach, L. I.—
N.M.G.

AL SINACEAE.

Cerastium viscosum L. Mouse-ear Chickweed.—Jelliffe.

Moehringia laterifolia (L) Fenzl. Blunt-leaved Sandwort.—
Jelliffe.

CARYOPHYLLACEAE.

Agrostemma Githago (L) Lam. Corn Cockle. Barnyard, C.
S.H.—G.H.H.

Alsine borealis Bigel. Northern Stitchwort. C.S.H., shaded
and wet places.—N.M.G.

Alsine longifolia Muhl. Long-leaved Stitchwort. Roadsides,
C.S.H.—G.H.H.

Alsine media L. Common Chickweed, C.S.H. vicinity—G.H.H.

Arenaria serpyllifolia L. Thyme-leaved Sandwort. C.S.H.
vicinity.—J.A.H.

Cerastium arvense L. Field Chickweed. C.S.H.—N.M.G.

Cerastium semidecandrum L. Small Chickweed. C.S.H. vicin-
ity.—N.M.G.

Dianthus armeria L. Deptford Pink. C.S.H. vicinity, in
fields.—N.M.G.

Honken
Bea
Lynchis
M.G.
Lynchis
Lynchis
C.S.
Sagina
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Cerato
M.
Nelum
Brase
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Casta
C.
Nym
Po
Lirio
M

- Honkenya peploides* (L) Ehrb. Sea-beach Sandwort. Gilgo Beach, L.I.—N.M.G.
- Lychnis alba* M. White Campion. Roadsides, C.S.H.—N. M.G.
- Lychnis coronaria* L. Mullein Pink. Hicksville.—N.M.G.
- Lychnis dioica* L. Red Campion. Waste Ground, roadsides, C.S.H.—N.M.G.
- Sagina procumbens*. L. Procumbent Pearlwort. Jones Marsh, C.S.H.—C.E.
- Saponaria officinalis* L. Bouncing Bet. Bayville, L. I.; roadsides, C.S.H.—N.M.G.
- Scleranthus annuus* L. German Knotgrass. Vicinity Biological Lab., C.S.H.—G.H.H.
- Silene antirrhina* L. Sleepy Catchfly.—Jelliffe.
- Silene caroliniana* Walt. Wild Pink. Vicinity C.S.H.—J.A.H.
- Silene latifolia* Mill. Bladder Campion. C.S.H. vicinity.—N. M.G.
- Silene noctiflora* L. Night-flowering Catchfly. C.S.H., Oyster Bay.—Jelliffe.
- Silene stellata* L. Starry Campion. Woods near roadside, C. S.H.—N.M.G.
- Tissa marina* L. (Britton) Salt-marsh Sand Spurry. Brackish sands, C.S.H. vicinity.—N.M.G.

CERATOPHYLLACEAE.

- Ceratophyllum demursum* L. Horn Weed. Lakes, C.S.H.—N. M.G.

NELUMBONACEAE.

- Nelumbo lutea* (Willd.) Pers. American Lotus.—Jelliffe.

NYMPHAEACEAE.

- Brasenia schreberi* Gmel. Water Shield. 1st lake, C.S.H.; Spectacle Pond, St. James, L.I.—N.M.G.

- Castalia odorata* (Cut.) Sweetscented Water Lily. 1st lake, C.S.H.—N.M.G.

- Nymphaea advena* Ait. Large Yellow Pond Lily. Spectacle pond, St. James, L. I.—N.M.G.

MAGNOLIACEAE.

- Liriodendron Tulipifera* L. Tulip tree. C.S.H. vicinity.—N. M.G.

RANUNCULACEAE.

- Actaea alba* (L) Milli. White Baneberry. Woods near 1st lake, C.S.H.—N.M.G.
- Anemone quinquefolia* L. Wind-flower. Vicinity C.S.H.—N. M.G.
- Anemone virginiana* L. Tall Anemone. Woods, C.S.H.—J. H.H.
- Aquilegia canadensis...* L. Wild Columbine. Woods, C.S.H.—J.H.H.
- Caltha palustris* L. Marsh Marigold. Vicinity C.S.H.—N. M.G.
- Cimicifuga racemosa* (L) Nutt. Black Snakeroot. Hodenpyl Estate, Locust Valley, L. I.—N.M.G.
- Clematis virginiana* L. Virginia Virgin's Bower. Fish Hatchery, C.S.H.—N.M.G.
- Helleborus viridis* L. Green Hellebore. Glen Cove.—N.M.G.
- Hepatica acutiloba*, D. C. Sharp-lobed Liverwort, Havemeyer Estate, near Oyster Bay, L. I.—N.M.G.
- Hepatica hepatica* (L) Karst. Round-lobed Liverwort. Havemeyer Estate.—N.M.G.
- Ranunculus abortivus* L. Kidney-leaved Crowfoot. C.S.H. vicinity.—N.M.G.
- Ranunculus acris* L. Tall Buttercup. C.S.H. vicinity.—N. M.G.
- Ranunculus bulbosus* L. Bulbous Buttercup. C.S.H. vicinity.—G.H.H.
- Ranunculus recurvatus*. Poir. Rough Crowfoot. C.S.H. vicinity.—N.M.G.
- Ranunculus repens* L. Creeping Buttercup. Along ditches, C.S.H.—N.M.G.
- Ranunculus scleratus* L. Celery-leaved Crowfoot. Oyster Bay.—Jelliffe.
- Ranunculus septentrionalis* Poir. Marsh Buttercup, C.S.H. vicinity.—N.M.G.
- Syndesmon thalictroides* (L) Hoffmg. Rue Anemone. Common throughout island.—Jelliffe.
- Thalictrum dioicum* L. Early Meadow-Rue. C.S.H. vicinity.—N.M.G.
- Thalictrum polygamum* Muhl. Fall Meadow Rue. Common throughout island.—Jelliffe.

Thalictr

Plain

Berberis

Carn

Menispe

Sand

Benzoin

—N.

Sassafr

Woo

Chelidoo

Macleya

Poin

Papaver

Bay

Sanguin

M.G

Fumari

Alliaria

logic

Arabis

G.H

Armor

C.S

Barbar

C.S

Barbar

Salt

Brassia

S.H

Thalictrum revolutum L. Waxy Meadow-Rue. Hempstead
Plains, Hicksville, L. I.—N.M.G.

BERBERIDACEAE.

Berberis vulgaris L. European Barberry. De Forest Estate;
Carnegie Inst., C.S.H.—N.M.G.

MENISPERMACEAE.

Menispermum canadense L. Canada Moonseed. Road to
Sandspit, C.S.H.—N.M.G.

LAURACEAE.

Benzoin aestivale (L) Nees. Spice Bush. Roadsides, C.S.H.
—N.M.G.

Sassafras Sassafras (L) Karst. Sassafras Tree. Roadsides,
Woods, C.S.H.—N.M.G.

PAPAVERACEAE.

Chelidonium majus L. Celandine, C.S.H., roadsides.—N.M.G.

Macleya cordata (Willd.) R. Br. Plume Poppy. Lloyd's
Point, L.I. Escaped from cultivation.—N.M.G.

Papaver dubium L. Long Smooth-fruited Poppy. Oyster
Bay, Fields.—Jelliffe.

Sanguinarea canadensis L. Boloroot. C.S.H. vicinity—N.
M.G.

FUMARIACEAE.

Fumaria officinalis L. Fumitory. C.S.H. vicinity.—N.M.G.

CRUCIFERAE.

Alliaria alliaria (L) Britton. Hedge Garlic. Vicinity Bio-
logical Lab., C.S.H.—G.H.H.

Arabis lyrata L. Lyre-leaved Rock-cress. Vicinity C.S.H.—
G.H.H.

Armoracia Armoracia (L) Britton. Horse-radish. Vicinity
C.S.H.—N.M.G.

Barbarea Barbarea (L) MacM. Yellow Rocket.—G.H.H.

Barbarea stricta (Andre) Marsh. Erect-fruited Winter-cress.
C.S.H.—Jelliffe.

Barbarea verna (Mill.) Aschers. Land Cress. Roadsides at
Salt Marsh, C.S.H.—G.H.H.

Brassica campestris L. var. *napus*. Turnip. Roadsides, C.
S.H.—N.M.G.

- Brassica nigra* (L) Koch. Black Mustard. Waste places, C.S.
H.—N.M.G.
- Brassica oleracea* L. Cabbage. Cultivated, C.S.H.—N.M.G.
- Bursa bursa-pastoris* (L) Britton. Shepherd's purse. Waste ground, C.S.H.—G.H.H.
- Cakile edentula* (Bigel.) Hook. American Sea Rocket. Sand of upper beach, C.S.H.—N.M.G.
- Carara didyma* (L) Britton. Lesser Wart-cress. Vicinity C.S.H.—G.H.H.
- Cardamine hirsuta* L. Hairy Bitter-cress. Oyster Bay, C.S. H.—N.M.G.
- Cardamine pennsylvanicum* Muhl. Pennsylvania Bitter-cress. C.S.H.—N.M.G.
- Diplotaxis muralis* (L) D.C. Sand Rocket. Roadsides, C. S.H.—N.M.G.
- Erysimum officinale* L. Hidge Mustard. Waste places, C.S.H.—N.M.G.
- Hesperis matronalis* L. Dame's Rocket. Vicinity, C.S.H.—G. H.H.
- Lepidium campestre* L. Field Cress. Vicinity C.S.H.—N. M.G.
- Lepidium virginicum* L. Wild Pepper-grass Vicinity C.S.H.—N.M.G.
- Norta altissima* (L) Britton. Tall Sisymbrium. Waste places, C.S.H.—N.M.G.
- Radicula sylvestris* L. Druce. Roadside near depot, C.S.H.—G.H.H.
- Raphanus sativus* L. Garden Radish. Cultivation C.S.H.—G.H.H.
- Sinapis alba* L. Escaped. White mustard.—Jelliffe.
- Sisymbrium Nasturtium—aquaticum* (L) True water-cress. Old fish runway, C.S.H.—N.M.G.
- Thlaspi arvense* L. Field Penny-cress. Waste places, C.S. H.—G.H.H.
- SARRACENIACEAE.
- Sarracenia purpurea* L. Pitcher Plant. Hodenpyl Estate, Locust Valley, N. Y.—N.M.G.

DROSERACEAE

- Drosera filiformis* Raf. Thread-leaved Sundew. C.S.H.—N.
M.G.
Drosera intermedia Hayne. Spatulate-leaved Sundew. Pine
Barren Bogs; Shores L. Ronkonkema, L. I.—N.M.G.
Drosera longifolia L. Oblong-leaved Sundew. L. Ronkonkema,
L. I.—N.M.G.
Drosera rotundifolia L. Round-leaved Sundew. C.S.H., be-
tween 2nd and 3d lakes.—N.M.G.

CRASSULACEAE.

- Penthorum sedoides* L. Ditch Stonecrop. Woodbury, L. I.—
N.M.G.
Sedum acre L. Wall-pepper. DeForest Cemetery, C.S.H.—
N.M.G.
Sedum Telephium L. Orpine. Roadsides, C.S.H.—N.M.G.
Sedum ternatum Mx. Wild Stonecrop. C.S.H. village, road-
side —G H H

SAXIFRAGACEAE.

- Chrysoplenium americanum*. L. Golden Saxifrage. Creek between 1st and 2nd lakes, C.S.H.—N.M.G.
Heuchera americana L. Alum-root. Oyster Bay.—Jelliffe.
Micranthes pennsylvanica (L) Haw. Swamp Saxifrage. Glen Cove.—Jelliffe.
Micranthes virginensis (Mx.) Early Saxifrage. Vicinity, C.S.H.—N.M.G.

HAMAMELIDACEAE.

- Hamamelis virginiana* L. Witch-Hazel, C.S.H. vicinity.—N.
M.G.
Liquidamber Styraciflua L. Sweet Gum. Cultivated. C.S.H.
vicinity.—N.M.G.

GROSSULARIACEAE.

- Ribes americanum* Mill. Wild Black Currant. C.S.H.—N.
M.G.
Ribes nigrum L. Black Currant. Escaped, C.S.H.—N.M.G.
Ribes triste, Pall. American Red Currant. C.S.H.—N.M.G.

PLATANACEAE.

- Platanus occidentalis* L. Plane Tree. C.S.H. vicinity.—N.
M.G.

ROSACEAE.

- Agrimonia gryposephala*. Wallr. Tall Hairy Agrimony. Jones Marsh, C.S.H.—C.E.
- Agrimonia parviflora*. Soland. Many-flowered Agrimony. C.S.H.—Jelliffe.
- Agrimonia rostellata* Wallr. Woodland Agrimony.—Jelliffe.
- Duchesnea indica*. Andr. Mock Strawberry. Roadsides, C. S.H.—N.M.G.
- Filipendula rubra* (Hill.) Robinson. Queen-of-the-Prairie. Escaped from cultivation, Lloyd's Point.—N.M.G.
- Fragaria vesca* L. Hedge Strawberry. Vicinity C.S.H.—J. A.H.
- Fragaria virginiana* Duchesne. Virginia Strawberry. Roadsides, C.S.H.—N.M.G.
- Geum canadense*. Jacq. White Avens. Moist woods, C.S.H.—N.M.G.
- Geum virginianum* L. Rough Avens. Roadsides, C.S.H.—N.M.G.
- Potentilla argentea* L. Silvery Cinquefoil. Roadsides, C.S.H.—G.H.H.
- Potentilla canadensis* L. Five-finger. Hempstead Plains, St. James, L. I., Pine Barrens.—N.M.G.
- Potentilla intermedia* L. Downy Cinquefoil. Waste places, roadsides, C.S.H.—N.M.G.
- Potentilla montspeliensis* L. Rough Cinquefoil. Road to Sand spit, C.S.H.—J.A.H.
- Potentilla montspeliensis* var. *norvegica* Rybd. Vicinity C. S.H.—J.A.H.
- Potentilla Robbinsiana*. Oakes. Robbins' Cinquefoil, C.S.H. vicinity.—J.A.H.
- Rosa carolina* L. Wild Rose. Woodbury Bog, Woodbury, L. I.—N.M.G.
- Rosa rubiginosa* L. Sweetbrier. Jones Marsh, C.S.H.—C.E.
- Rubus alleghaniensis*. Porter. Mountain Blackberry. roadside, Salt Marsh, C.S.H.—H.S.C.
- Rubus baileyanus*. Britton. Bailey's Blackberry. C.S.H.—G.H.H.
- Rubus canadensis* Linn. Millspaugh's Blackberry. Jones' woods, C.S.H.—N.M.G.

- Rubus hispida* L. Running Swamp Blackberry. Vicinity C.S.H.—N.M.G.
- Rubus neglectus*. Peck. Purple Wild Raspberry. Huntington Hill road, C.S.H.—N.M.G.
- Rubus occidentalis* L. Black Raspberry. Vicinity C.S.H.—J.A.H.
- Rubus odoratus* L. Thimbleberry, C.S.H.—N.M.G.
- Rubus phoeniculasius*. Maxim. Wineberry. Escaped from cultivation, C.S.H.—N.M.G.
- Rubus procumbens* Muhl. Dewberry. Roadsides, C.S.H.—N.M.G.
- Rubus strigosus* Mchx. Wild Red Raspberry. Vicinity C.S.H.—J.A.H.
- Sanguisorba canadensis* L. American Great Burnet. Common throughout island.—Jelliffe.
- Schizoneurus sorbifolius* L. Sorb-leaved Schizoneurus. Vicinity C.S.H.—N.M.G.
- Sibbaldiopsis tridentata* (Solona) Rydb. Three-toothed Cinquefoil. Hodenpyl estate, Locust Valley, L. I.—N.M.G.
- Spiraea latifolia* Borkh. American Meadow-Sweet. Roadsides, C.S.H.—N.M.G.
- Spiraea tomentosa* L. Hardhack. L. Ronkonkema, L. I.—N.M.G.

MALACEAE.

- Amelanchier canadensis*. Medic. Service Berry. C.S.H.—N.M.G.
- Amelanchier spicata*. Chowl D. C. Low June Berry. C.S.H.—N.M.G.
- Aronia arbutifolia* Pers. Red Choke-berry. Vicinity C.S.H.—N.M.G.
- Aronia atropurpurea* Britton. Purple-fruited Choke-berry. Pine barrens, L.I.—N.M.G.
- Aronia melanocarpa* (Mischx) Britton. Black Choke-berry. C.S.H.—N.M.G.
- Crataegus Oxyacantha* Linn. English Hawthorne. Davenport property, C.S.H.—N.M.G.
- Malus malus* (L) Britton. Apple. Vicinity C.S.H.—N.M.G.
- Pyrus communis* L. Choke Pear. Cultivated. C.S.H.—N.M.G.

Sorbus americana Dum Cours. American Mountain Ash.
Cultivated C.S.H.—N.M.G.

Sorbus Aucuparia. L. European Mountain Ash. C.S.H.—
N.M.G.

AMYGDALACEAE.

Prunus Avium L. Crab Cherry. Road near 1st lake C.S.H.—
N.M.G.

Prunus Cerasus L. Sour Cherry. Vicinity C.S.H.—N.M.G.

Prunus maritima Wong. Beach Plum. Bayville, L.I., Sand
dunes.—N.M.G.

CAESALPINACEAE.

Cassia marilandica. L. Wild Senna. Oyster Bay.—Jelliffe.

Chamaecrista fasciculata (Michx.) Greene Prairie Pea. C.S.
H.—N.M.G.

Chamaecrista nictitans (L) Moench. Sensitive Pea. In fields
C.S.H.—N.M.G.

Gleditsia triacanthos L. Black Locust. C.S.H.—N.M.G.

FABACEAE.

Amorpha fruticosa. L. False Indigo. Davenport Estate, C.
S.H.—N.M.G.

Baptisia tinctoria L. R. Br. Wild Indigo. Vicinity 3rd Lake,
C.S.H.; Hempstead Plain.—N.M.G.

Cracca virginiana L. Goat's Rue. Vicinity C.S.H.—N.M.G.

Falcata comosa. Kuntze. Hog Pea-nut. Jones woods near
first lake.—G.H.H.

Glycine sp? Jones' woods, Vicinity C.S.H.—G.H.H.

Lathyrus latifolius L. Everlasting Pea. In gardens, escap-
ing to thickets, C.S.H.—N.M.G.

Lathyrus maritimus (L) Bigel. Beach Pea. Beaches, C.S.H.
and vicinity—N.M.G.

Lespedeza capitata Michx. Round-headed Bush-clover. R.R.
west of depot, C.S.H.—G.H.H.

Lespedeza frutescens. Britton. Wand-like Bush-clover. R.R.
west of Depot, C.S.H.—G.H.H.

Lespedeza hirta L. Hairy Bush-Clover. Pine Barrens near
St. James, L. I.—N.M.G.

Lespedeza repens. Creeping Brush-Clover. R.R. west of De-
pot, C.S.H.—N.M.G.

Lespedeza cirsinica L. Slender Bush-Clover. R.R. west of
depot, C.S.H.—N.M.G.

- Lupinus perennis* L. Wild Lupine. Syosset,—H.S.C.
Medicago lupulina L. Hop Clover. C.S.H.—J.A.H.
Medicago sativa L. Alfalfa. C.S.H.—N.M.G.
Meibomia canescens Kuntze. Hoary Tick-Trefoil. Near Syosset.—H.S.C.
Meibomia grandiflora (Walt.) Kuntze. Pointed-leaved Tick-Trefoil.—N.M.G.
Meibomia marilandica (L) Kuntze. Smooth Small-leaved Tick-Trefoil. Oyster Bay.—N.M.G.
Meibomia Michauxii Vail. Prostrate Tick-Trefoil. R.R. west of depot, C.S.H.—G.H.H.
Meibomia nudiflora (L) Kuntze. Naked-flowered Tick-Trefoil. Woods near Eugenics Record Office.—N.M.G.
Meibomia paniculata (L) Kuntze. Paniced Tick-Trefoil. Oyster Bay.—N.M.G.
Meibomia rigida Kuntze. Rigid Tick-Trefoil. C.S.H. vicinity.—N.M.G.
Melilotus alba Desr. White Melilot. Roadside, C.S.H. — N.M.G.
Melilotus officinalis Lam. Yellow Melilot. C.S.H., in fields. —N.M.G.
Robinia pseudoacacia L. Locust-tree. Vicinity C.S.H.—N. M.G.
Strophostyles helvola (L) Britton. Trailing Wild Bean. Sand spit, C.S.H.—N.M.G.
Stylosanthes biflora (L) B.S.P. Pencil Flower. Syosset.—H.S.C.
Trifolium agrarium L. Yellow Hop-Clover. C.S.H., sandy fields, roadsides.—N.M.G.
Trifolium arvense L. Rabbit-foot. Gravelly soil, roadsides, C.S.H.—N.M.G.
Trifolium hybridum L. Alsatian Clover. Fields and roadsides, C.S.H.—N.M.G.
Trifolium pratense L. Red Clover. Roadsides and fields, C. S.H.—N.M.G.
Trifolium procumbens L. Low Hop-Trefoil. Vicinity, C.S.H. —N.M.G.
Trifolium repens L. White Clover. Roadsides, Lawns, C.S.H. —N.M.G.
Vicia Cracca L. Cow Vetch. In fields, C.S.H.—N.M.G.

Vicia tetrasperma L. Slender Vetch. Roadsides, C.S.H.—G.
H.H.

Wisteria chinensis Sweet Wisteria. Escaped, cultivated, C.S.
H.—N.M.G.

GERANIACEAE.

Geranium Bicknellii Britton. Bicknell's Crane's-bill. C.S.H.—
N.M.G.

Geranium maculatum L. Spotted Crane's-bill. Woods, C.S.
H., Hempstead Plain,—N.M.G.

Geranium pusillum Burm. Small flowered Crane's-bill. Vicin-
ity C.S.H.—N.M.G.

OXALIDACEAE.

Xanthoxalis grandis. Small. Great Yellow Wood-sorrel. C.
S.H.—N.M.G.

Xanthoxalis corniculata (L) Small. Yellow Procumbent
Wood-sorrel. Vicinity C.S.H.—N.M.G.

Xanthoxalis stricta (L) Small. Upright Yellow Wood-sor-
rel. Roadsides, C.S.H.—G.H.H.

LINACEAE.

Cathartolinum floridanum (Planch) Small. Florida Yellow
Flax—Jelliffe.

Cathartolinum medium (Planch) Small. Stiff Yellow Flax.
Jones Marsh, C.S.H.—C.E.

Linum usitatissimum. Flax. Pine Barrens, L. I.—G.H.H.

Millegrana Radiola (L) All-seed. Vicinity C.S.H.—G.H.H.

BALSAMINACEAE.

Impatiens balsamina Linn. Touch-me-not. Jones Marsh, C.
S.H.—N.M.G.

Impatiens biflora. Walt. Spotted Touch-me-not. C.S.H.
Moist woods.—N.M.G.

Impatiens noli-tangere L. Jones Marsh, C.S.H.—N.M.G.

RUTACEAE.

Ptelea trifoliata L. Three-leaved Hop-tree, C.S.H. village.—
N.M.G.

Zanthoxylum americanum Mill. Prickley Ash. Oyster Bay,
Glen Cove.—Jelliffe.

SIMAROUBACEAE.

Ailanthus glandulosa Desf. Ailanthus. Vicinity C.S.H. —
N.M.G.

POLYGALACEAE.

- Polygala Nuttallii* F. and G. Nuttall's Milkwort. Vicinity C.S.
H.—N.M.G.
Polygala polygama Walt. Racemed Milkwort. Hempstead
Plains, L. I.—N.M.G.
Polygala verticillata L. Whorled Milkwort. Vicinity C.S.H.
—N.M.G.
Polygala viridescens L. Purple Milkwort. Hempstead Plain,
Hicksville, L. I.—N.M.G.

EUPHOBRIACEAE.

- Acalypha virginica* L. Mercury-weed. Vicinity C.S.H.—N.
M.G.
Chamaesyce humistrata, (Engelm.) Small. Hairy Spreading
Spurge. Common.—N.M.G.
Chamaesyce maculata L. Small. Milk Purslane. R.R., west
of Depot C.S.H.—G.H.H.
Chamaesyce polygonifolia (L) Small. Seaside Spurge. Upper
Beach, C.S.H.—N.M.G.
Ricinus communis L. Castor Bean.—N.M.G.
Tithymalopsis corollata (L) Kl. and Garcke. Flowering
Spurge. Matheson Estate, Lloyd's Neck.—N.M.G.
Tithymalopsis Ipecacuanhae (L) Small. Wild Ipecac. Vicin-
ity C.S.H.—G.H.H.
Tithymalus Cyapriissias (L) Hill. Cypress Spurge.—N.M.G

CALLITRICHACEAE.

- Callitricha heterophylla* Pursh. Larger Water-Starwort. C.
S.H. vicinity.—N.M.G.

BUXACEAE.

- Pachysandra procumbens* Mchx. Alleghany Mountain Spurge.
Hicks Nursery, Westbury, L. I.—N.M.G.

ANACARDIACEAE.

- Rhus copallina* L. Dwarf Black Sumac. C.S.H.; Hempstead
Plains, L. I.—N.M.G.
Rhus glabra L. Scarlet Sumac, C.S.H.—N.M.G.
Rhus hirta L. Staghorn Sumac. C.S.H.—N.M.G.
Toxicodendron radicans (L) Kuntze. Poison Ivy. Common.
—N.M.G.
Toxicodendron vernix (L) Kuntze. Poison Sumac. Between
1st and 2nd lakes, Bunker Swamp.—N.M.G.

ILICACEAE.

Ilex laevigata (Pursh) A. Gray. Gray Smooth Winterberry.
Oyster Bay.—Jelliffe.

Ilex opaca Ait. American Holly. Vicinity C.S.H.—N.M.G.

Ilex verticillata (L) Gray. Virginia Winterberry. Low
thicket, Jones Marsh, C.S.H.—N.M.G.

CELASTRACEAE.

Celastrus scandens L. Climbing Bittersweet. Huntington
Hill roadside, C.S.H.—N.M.G.

Erythronium atropurpureum Jacq. Burning Bush. Cultivated.
Hick's Nursery, Westburg, L. I.—N.M.G.

Erythronium radicans Sieb. Roadside, near De Forest Estate,
C.S.H.—N.M.G.

STAPHYLEACEAE.

Staphylea trifolia L. American Bladder nut. Cultivated, C.
S.H.—N.M.G.

ACERACEAE.

Acer Negundo L. Box Elder, C.S.H.—N.M.G.

Acer pennsylvanicum L. Striped Maple. Near Cold Spring
Harbor Village.—N.M.G.

Acer platanoides L. Norway Maple. Roads and lawns, C.S.
H.—N.M.G.

Acer Pseudo-Platanus L. Sycamore Maple. Matheson Estate,
Lloyd Neck, L. I.—N.M.G.

Acer rubrum L. Red Maple. Woods, C.S.H.—N.M.G.

Acer saccharinum L. Silver Maple. Matheson Estate—N.
M.G.

Acer saccharum Marsh. Sugar Maple. C.S.H. vicinity.—N.
M.G.

AESCLULACEAE.

Aesculus Hippocastaneum L. Horse-Chestnut. Jones Estate,
C.S.H.—N.M.G.

RHAMNACEAE.

Ceanothus americanus L. New Jersey Tea. Hempstead Plains,
Hicksville, L. I.—N.M.G.

Rhamnus cathartica L. Buckthorn. Vicinity C.S.H.—G.H.H.

VITACEAE.

Parthenocissus quinquefolia Planch. Virginia Creeper. Com-
mon. C.S.H.—N.M.G.

Vitis aestivalis Mx. Summer Grape. Woods, C.S.H.—N.

M.G.

Vitis bicolor (Le Conte) Blue Grape. Jones Woods, C.S.H.—N.M.G.

Vitis cordifolia Mchx. Frost Grape. Vicinity C.S.H.—G. H.H.

Vitis Labrusca L. Northern Fox-grape. Roadsides, C.S.H.—N.M.G.

TILIACEAE.

Tilia americana L. American Linden. Davenport Lawn, C. S.H.—N.M.G.

Tilia pubescens Ait. Southern Bass-wood. Common throughout island.—Jelliffe.

MALVACEAE.

Abutilon Abutilon Rusky. Velvet leaf. Vicinity C.S.H. —G. H.H.

Althaea officinalis L. Marsh-Mallow. Oyster Bay.—Jelliffe.

Callirhoe involucrata (T. and G.) Gray. Purple Poppy-Mallow. Hicks Nursery, Westbury, L. I.—N.M.G.

Hibiscus esculentus L. Laughlin garden, C.S.H.—G.H.H.

Hibiscus moscheutos L. Swamp Rose-Mallow. Fresh water marsh, C.S.H.—N.M.G.

Hibiscus oculiroseus Britton. Crimson-eye Rose-Mallow. Fresh water marsh, C.S.H.—N.M.G.

Hibiscus Syriacus. L. Rose-of-Sharon. Eugenics Record Office, C.S.H.—N.M.G.

Malva Alcea L. European Mallow. C.S.H. village.—G.H.H.

Malva moschata L. Musk Mallow. C.S.H.—Jelliffe.

Malva rotundifolia L. Dwarf Mallow. Roadsides, C.S.H.—N.M.G.

HYPERICACEAE.

Ascyrum hypericoides L. St. Andrew's Cross.—N.M.G.

Hypericum adpressum Bart. Creeping St. John's-wort. Lloyd's Point, L. I.—G.H.H.

Hypericum canadense L. Canadian St. John's-wort. Salt Marsh, C.S.H.—H.S.C.

Hypericum mutilum L. Dwarf St. John's-wort. Davenport Farm, C.S.H.—N.M.G.

Hypericum perforatum L. Common St. John's-wort. Fields, C.S.H.—N.M.G.

Hypericum punctatum (Lam) Spotted St. John's-wort. C.S.H.—N.M.G.

Sarothra gentianoides L. Orange-grass. C.S.H. Hempstead Plain, Hicksville, L. I.—N.M.G.

Triadenum virginicum (L) Raf. Marsh St. John's-wort. Fresh water swamp, C.S.H.—J.A.H.

CISTACEAE.

Crocanthemum canadense (L) Britton. Rock-rose. C.S.H.—N.M.G.

Crocanthemum majus (L) Britton. Hoary Frostweed. Hempstead Plain, Hicksville, L. I.—N.M.G.

Hudsonia tomentosa Nutt. False Heather. Bayville, L. I.—N.M.G.

Lechea intermedia Leggett. Large-podded Pinweed. Syosset, L. I.—H.S.C.

Lechea maritima Leggett. Beach Pinweed. Oyster Bay.—Jelliffe.

Lechea minor L. Thyme-leaved Pinweed. Oyster Bay.—Jelliffe.

Lechea villosa Ell. Large Pinweed. Hempstead Plain, Pine Barren region, L. I.—N.M.G.

VIOLACEAE.

Viola arvensis Murr. European Field Pansy. Near Laboratory, C.S.H.—N.M.G.

Viola blanda Willd. Sweet White Violet. C.S.H.—J.A.H.

Viola fimbriatula Sm. Ovate-leaved Violet.—G.H.H.

Viola incognita (var. *Forbesii*) Brainerd. Large-leaved White Violet. C.S.H.—N.M.G.

Viola lanceolata L. Water Violet. Common throughout island.—Jelliffe.

Viola labradorica Schrank. Alpine Violet. Vicinity C.S.H.—J.A.H.

Viola odorata L. Sweet Violet. Vicinity C.S.H.—J.A.H.

Viola palmata L. Early Blue Violet. C.S.H.—N.M.G.

Viola pallens (Banks) Brainerd. Northern White Violet. C.S.H.—N.M.G.

Viola papilionacea domestica (Bisk) Coll. Hooded Blue Violet.

—J.A.H.

Viola pedata L. Bird's-foot Violet. Hempstead Plains, Hicksville, L. I.—N.M.G.

Viola primulifolia L. (Harper) Primrose-leaved Violet. Common throughout island.—N.M.G.

Viola pubescens Ait. Downy Yellow Violet. Common throughout island.—N.M.G.

Viola sagittata L. Arrow-leaved Violet. West Hills, Huntington, L. I.—B. Watt.

Viola scabriuscula Schwein. Smooth Yellow Violet. Vicinity C.S.H.—J.A.H.

Viola sororia Willd. Woolly Blue Violet. Vicinity C.S.H.—G.H.H.

Viola tricolor L. Pansy. Common throughout island.—Jeliffe.

CACTACEAE.

Opuntia Opuntia (L) Coul. Eastern Prickly Pear. C.S.H. vicinity.—N.M.G.

ELEAGNACEAE.

Eleagnus argentea Pursh. Silver-berry. Jones farm; Hoden-pyl Estate, Locust Calley, L. I.—N.M.G.

LYTHRACEAE.

Decodon verticillata (L) Ell. Swamp Loosestrife. Pine Barrens; Swamps, L. I.—N.M.G.

Lythrum Salicaria L. Spiked Loosestrife. Matheson Estate, Lloyd Neck, L. I.—N.M.G.

MELASTOMACEAE.

Rhexia virginica. Meadow-Beauty. Kettle Hole Bog, Woodbury, L. I.—H.S.C.

ONAGRACEAE.

Chamaenerion angustifolium (L) Scop. Fire-Weed. Pine Barrens, Hempstead Plain.—N.M.G.

Circaea lutetiana L. Enchanter's Nightshade. Woods, C.S. H.—N.M.G.

Epilobium coloratum, Muhl. Purple-leaved Willow-herb. Dying Pond vicinity, C.S.H.—N.M.G.

Isnardia palustris L. Marsh Purslane. Muddy ditches, swamps, C.S.H.—J.A.H.

- Kneiffia fructicosa* (L) Raimann. Common Sundrops. C.S. H. vicinity.—N.M.G.
- Kneiffia linearis* (Michx) Spach. Narrow-leaved Sundrops. C.S.H. vicinity.—N.M.G.
- Kneiffia pumila* (L) Spach. Small Sun-drops. Vicinity C. S.H.—J.A.H.
- Ludwigia alternifolia* L. Rattlebox. Swamps, C.S.H.—N. M.G.
- Oenothera biennis* L. Common Evening Primrose. Roadsides, C.S.H.—N.M.G.
- Oenothera muricata* L. Northern Evening Primrose. Sandy or gravelly soils, C.S.H.—N.M.G.
- Oenothera oakesiana* Robbins. Oakes' Evening Primrose. Roadsides, C.S.H.—G.H.H.

HALORAGIDACEAE.

- Myriophyllum humile* (Raf) Morang. Low Water Milfoil. C.S.H.—E.N.T.
- Myriophyllum pinnatum* (Walt) B.W.P. Pinnate Water Milfoil. Lakes, C.S.H.—N.M.G.
- Myriophyllum tenellum* Bigel. Slender Water Milfoil. 4th lake, C.S.H.—N.M.G.
- Proserpinaca palustris* L. Mermaid-weed. Oyster Bay; ponds. Babylon.—Jelliffe.

ARALIACEAE.

- Aralia hispida* Vent. Bristly Sarsaparilla. Jones Woods, C. S.H.—N.M.G.
- Aralia nudicaulis* L. Wild Sarsaparilla. Jones Woods, C.S.H. N.M.G.
- Aralia racemosa* L. American Spikenard. Oyster Bay.—Jelliffe.
- Aralia spinosa* L. Hercules' Club. C.S.H.—N.M.G.
- Panax trifolium* L. Dwarf Ginseng. Vicinity C.S.H.—G.H.H.

AMMIACEAE.

- Aegopodium Podagraria* var. *variegatum* Bailey. Goutweed. Fish Hatchery, C.S.H.—G.H.H.
- Aethusa cynapium* L. Fool's Parsley. Marsh, C.S.H.—Jelliffe.
- Conium maculatum* L. Poison Hemlock. C.S.H. vicinity, D. S.J.

- Daucus carota* L. Wild Carrot. C.S.H., fields.—N.M.G.
Deringia canadensis (L) Kuntze. Honewort. C.S.H.—N.M.G.
Heracleum lanatum Michx. Cow-Parsnip. Oyster Bay.—Jelliffe.
Hydrocotyle americana L. American Marsh-Pennywort. Wet places C.S.H.—N.M.G.
Lilaeopsis lineata Greene. Lilaeopsis. In mud of marshes, C.S.H.—J.W.H.
Pastinaca sativa L. Wild Parsnip. Common throughout island.—Jelliffe.
Ptilimnium capillaceum (Michx) Mock Bishop-Wood. Brackish water, C.S.H.—J.W.H.
Sanicula canadensis L. Short-styled Snakeroot. Vicinity C.S.H.—G.H.H.
Sanicula marylandica L. Black Snake-Root.—Jelliffe.
Sium cicutaefolium Gmel. Hemlock Water-Parsnip. Dying Pond vicinity, C.S.H.—N.M.G.
Thaspium trifoliatum aureum (Nutt) Britton. Purple Meadow-Parsnip. Syosset, L.I.—H.S.C.
Washingtonia Claytoni, Britton. Hairy Sweet-Cicely. Vicinity C.S.H.—J.A.H.
Washingtonia longistylis Britt. Smoother Sweet-Cicely. C.S.H. vicinity.—J.A.H.

CORNACEAE.

- Cornus alternifolia* L. Alternate-leaved Dogwood. De Forest Estate, C.S.H.—G.H.H.
Cornus Amomum Mill. Silky Cornel. Oyster Bay.—Jelliffe.
Cornus stolonifera Michx. Red-osier Dogwood. De Forest Estate. C.S.H.—G.H.H.
Cynoxylon floridum (L) Raf. Flowering Dogwood. C.S.H. vicinity.—N.M.G.
Nyssa sylvatica Marsh. Sour Gum. Vicinity C.S.H.—N.M.G.

CLETHRACEAE.

- Clethra alnifolia* L. Sweet Pepper-bush. Vicinity of lakes, C.S.H.—N.M.G.

PYROLACEAE.

- Chimaphila maculata* (L) Pursh. Spotted Wintergreen. Moistwoods, C.S.H.—N.M.G.

- Chimaphila umbellata* (L) Leather-leaf. Pine Barrens, St. James, L. I.—N.M.G.
Pyrola americana Sweet. Round-leaved American Winter-green. Moist Woods, C.S.H.—N.M.G.
Pyrola elliptica Nutt. Shin-leaf. Vicinity C.S.H.—N.M.G.

MONTROPACEAE.

- Hypopitys americana* (D.C.) Small. False Beech-Drops. Rich Woods, C.S.H.—N.M.G.
Monotropa uniflora L. Indian Pipe. Rich Woods, C.S.H.—N.M.G.

ERICACEAE.

- Uva-Ursi Uva-Ursi* (L) Britton. Red Bear berry. Bayville, L. I.; Gilgo Beach.—N.M.G.
Azalea nudiflora L. Pinkster-flower. C.S.H. vicinity.—N. M.G.
Azalea viscosa L. Swamp Pink. Fresh water swamp, C.S.H.—N.M.G.
Calluna vulgaris (L) Hull. Heather. Hodenpyl Estate, Locust Valley, L. I.—N.M.G.
Chamaedaphne calyculata L. Leather-leaf. Pine Barrens, St. James, L. I.—J.W.H.
Epigaea repens L. Trailing Arbutus. Vicinity C.S.H.—N.M.G.
Eubotrys racemosa (L) Gray. Swamp Eubotrys. Havemeyer Estate, Locust Valley, L. I.—N.M.G.
Gaultheria procumbens L. Checkerberry. De Forest Estate, C.S.H.—N.M.G.
Kalmia latifolia L. Mountain Laurel. C.S.H. Woods, slopes.—N.M.G.
Ledum groenlandicum Oeder. Labrador Tea. Havemeyer Estate, Oyster Bay, L. I.—N.M.G.
Neoperis mariana (L) Britton. Stagger Bush. Hempstead Plains, Hicksville.—N.M.G.
Oxydendrum arboreum (L) D.C. Sour-wood. Near R.R. depot, C.S.H.—N.M.G.
Rhododendron maximum (L) Torr. Great Laurel. Swamp, 1st lake, C.S.H.—N.M.G.
Xolisma ligustrina Britton. Privet Andromeda. Vicinity C. S.H.—J.A.H.

VACCINACEAE.

- Gaylussacia baccata* (Wang.) K. Koch. Black Huckleberry.
Bayville, N. Y.—N.M.G.
- Gaylussacia frondosa* (L.) T. & G. Huckleberry. Lakes in
vicinity, C.S.H.—N.M.G.
- Oxycoccus macrocarpus* (Ait.) Pursh. Large Cranberry.
Marsh near L. Ronkonkema, L. I.—N.M.G.
- Vaccinium angustifolium* Ait. Dwarf Blueberry. Dry hills,
C.S.H.—N.M.G.
- Vaccinium corymbosum* L. Tall Blueberry. Moist Woods 2nd
lake, C.S.H.—N.M.G.
- Vaccinium vacillans* Kalm. Low Blueberry. Dry Soil, C.S.
H.—N.M.G.
- Vitis-Idaea Vitis-Idaea* (L.) Britton. Mountain Cranberry.
Rocky soil, Bayville, L. I.—N.M.G.

PRIMULACEAE.

- Anagallis arvensis* L. Red Pimpernel. Shore of pond at
monastery C.S.H.—N.M.G.
- Dodecatheon Meadia* L. American Cowslip. Glen Cove. Jel-
liffe.
- Lysimachia Nummularia* L. Moneywort. Damp Places, C.S.
H.—N.M.G.
- Lysimachia quadrifolia* L. Whorled Loosestrife. Woods, C.
S.H.—N.M.G.
- Lysimachia producta* (Gray) Fernald. Damp Thickets, C.S.
H.—N.M.G.
- Lysimachia terrestris* L. Bulb-bearing Loosestrife. Low
ground, C.S.H.—N.M.G.
- Naumburgia thyrsiflora* (L.) Duby. Tufted Loosestrife.
Glen Cove.—Jelliffe.
- Samolus xoribundos* H.B.N. Water Pimpernel. N. and E.
Shore, C.S.H.—N.M.G.
- Steironema lanceolatum* (Walt) Gray. Lance-leaved Loose-
strife. Woodbury, L. I.—N.M.G.
- Trिएलिस americana* Pursh. Starflower. C.S.H. vicinity.—
N.M.G.

PLUMBAGINACEAE.

- Limonium carolinianum*. Britton. Sea Lavendar. Salt Marsh-
es, C.S.H.—N.M.G.

EBENACEAE.

Diospyros virginiana L. Persimmon. Jones Farm, C.S.H.—N.M.G.

STYROCÆAE.

Halesia carolina L. Silver-bell. Vicinity, C.S.H.—G.H.N.

OLEACEAE.

Chionanthus virginica L. Fringe-tree. Vicinity C.S.H.—J. A.H.

Fraxinus americana L. White Ash. Common, C.S.H.—N. M.G.

Fraxinus americana L. var. *aecidiosa*. Shull. Huntington Hill Rd.—N.M.G.

Fraxinus nigra Marsh. Black Ash. Oyster Bay.—Jelliffe.

Ligustrum vulgare L. Privet. Cultivated C.S.H.—N.M.G.

Syringa vulgaris L. Lilac. Cultivated C.S.H.—N.M.G.

GENTIANACEAE.

Bartonia virginica (L) Yellow Bartonia. Moist Soil, C.S.H.—N.M.G.

Dasytaphana Andrewii (Griseb) Small. Closed Gentian. C. S.H.—G.H.H.

Gentiana crinita Froel. Fringed Gentian.—Jelliffe.

Nymphoides lacunosum (Vent) Kuntze. Floating Heart. Pond near L. Ronkonkema, L. I.—N.M.G.

Sabbatia stellaris Pursh. Marsh Pink. Salt meadow, Gilgo Brach, L. I.—N.M.G.

APOCYNACEAE.

Apocynum androsaemifolium L. Spreading Dogbane. Hempstead Plains, Hicksville.—N.M.G.

Apocynum cannabinum L. Indian Hemp, C.S.H. vicinity.—N.M.G.

Apocynum medium Greene. Intermediate Dogbane. Pine Barrens, St. James, L. I.—N.M.G.

Vinca Minor L. Periwinkle. Cultivated C.S.H.—N.M.G.

ASCLEPIADACEAE.

Asclepias amplexicaulis J. E. Smith. Blunt-leaved Milkweed. Syosset.—H.S.C.

Asclepias exaltata (L) Muhl. Tall Milkweed. Vicinity C. S.H.—J.A.H.

- Asclepias pulchra* (Ehrb.) Pers. Hairy Milkweed. Fresh water swamps.—C.S.H.
- Asclepias purpurascens* L. Purple Milkweed. Hempstead Plains, Hicksville. L. I.—N.M.G.
- Asclepias quadrifolia* Jacq. Four-leaved Milkweed. Oyster Bay—Jelliffe.
- Asclepias syriaca* L. Common Milkweed. Moist fields, C.S.H. N.M.G.
- Asclepias tuberosa* L. Butterfly-weed. Hempstead Plain, Hicksville, L. I.—N.M.G.
- Asclepias variegata* L. White Milkweed. Glen Cove.—Jelliffe.
- Asclepias verticillata* L. Whorled Milkweed. Hempstead Plain, Hicksville, L. I.—N.M.G.
- Periploca graeca* L. Silkvine. W. Side, C.S.H.—D.S.J.

CONVOLVULACEAE.

- Convolvulus arvensis* L. Small Bindweed. Vicinity C.S.H.—G.H.H.
- Convolvulus sepium* L. Great Bindweed. Vicinity C.S.H.—G.H.H.

CUSCUTACEAE.

- Cuscuta Gronovii* Willd. Gronovius' Dodder. Jones Marsh, C.S.H.—G.H.H.

POLEMONIACEAE.

- Phlox paniculata* L. Garden Phlox. Road to Eugenics Record Office. Vicinity C.S.H.—G.H.H.

BORAGINACEAE.

- Cynoglossum officinale* L. Hound's Tongue. Vicinity C.S.H.—G.H.H.

- Echium vulgare* L. Viper's Bugloss. Hodenpyle Estate, Locust Valley, L. I.—N.M.G.

- Myosotis scorpioides* (L) Forget-me-not. Oyster Bay; es-
caped.—Jelliffe.

VERBENACEAE.

- Verbena hastata* L. Blue Vervain. Common throughout isl-
and.—Jelliffe.

- Verbena urticifolia* L. White Vervain. Waste Ground, C.S.
H. vicinity.—N.M.G.

LABIATAE.

- Agastache nepetoides* Kuntze. Catnip Giant Hyssop. Vicinity C.S.H.—G.H.H.
- Collinsonia canadensis* L. Citronella. Jones Woods, C.S.H., near 1st Lake.—G.H.H.
- Cunila origanoides* (L) Brit. Stone Mint. Vicinity C.S.H.—N.M.G.
- Galeopsis Tetrahit* L. Hemp-Nettle. Oyster Bay—Jelliffe.
- Glecoma hederacea* L. Ground Ivy. C.S.H.—N.M.G.
- Koellia flexuosa* (Walt) MacM. Narrow-leaved Mountain Mint. Hempstead Plains, Hicksville, L. I.—N.M.G.
- Koellia virginiana* (L) MacM. Virginia Mountain mint—Jelliffe.
- Lamium amplexicaule* L. Henbit. Vicinity C.S.H.—J.A.H.
- Leonurus Cardiaca* L. C.S.H. Waste places—N.M.G.
- Lycopus americanus* Muhl. C.S.H., rich moist ground.—N. M.G.
- Lycopus membranaceus* Michx. Rich moist ground, C.S.H.—N.M.G.
- Lycopus sessilifolius* A. Gray. Gilgo beach, L. I.—N.M.G.
- Lycopus virginicus* L. Cut-leaved Water Hoarhound. Rich moist ground, C.S.H.—H.S.C.
- Marrubium vulgare* L. Common Hoarhound. Oyster Bay.—Jelliffe.
- Melissa officinalis* L. Bee-balm. C.S.H. vicinity.—J.A.H.
- Mentha canadensis* L. American Wild Mint. Vicinity Biological Laboratory, C.S.H.—G.H.H.
- Mentha citrata* Ehr. Bergamot Mint. C.S.H. Vicinity.—N. M.G.
- Mentha piperita* L. Peppermint. Jones Marsh, C.S.H.—G. H.H.
- Mentha spicata* L. Spearmint. Roadside near Sandspit, C.S. H.—G.H.H.
- Monarda didyma* L. Oswego Tea. Moist fields, C.S.H.—N. M.G.
- Monarda fistulosa* L. Wild Bergamot. C.S.H. vicinity.—G. H.H.
- Nepeta Cataria* L. Catnip. C.S.H. Common.—N.M.G.
- Perilla frutescens* (L) Britton. Beef-steak Plant. C.S.H., Waste fields.—N.M.G.

Prunella vulgaris L. Self-heal. Roadsides, C.S.H.—N.M.G.
Salvia lyrata L. Wild Sage. Matheson estate, Lloyd Neck,
L. I.—N.M.G.

Scutellaria galericulata L. Hooded Willow-herb. Common
throughout island.—Jelliffe.

Scutellaria integrifolia L. Larger Skullcap. Hempstead Plains,
Hicksville, L. I.—N.M.G.

Scutellaria lateriflora L. Mad-dog Skullcap. C.S.H.—N.
M.G.

Stachys hyssopifolia Michx. Hyssop Hedge Nettle. Pine
Barrens, St. James, L. I.—N.M.G.

Teucrium canadense L. Wood Sage. Common throughout
island.—Jelliffe.

Trichostema dichotoma L. Blue Curls. Vicinity Biological
Lab. C.S.H.—G.H.H.

SOLANACEAE.

Datura Stramonium L. Jimson-weed. C.S.H.—N.M.G.

Hyoscyamus niger L. Black Henbane. Glen Cove, L. I.—
Jelliffe.

Lycium halimifolium Mill. Matrimony Vine. Vicinity C.S.H.
Village.—G.H.H.

Physalis pubescens L. Low Hairy Ground Cherry. C.S.H.—
N.M.G.

Physalis virginiana Mill. Virginia Ground-cherry. C.S.H.—
Jelliffe.

Physalis viscosa L. Yellow Henbane. Vicinity Biological
Lab., C.S.H.—N.M.G.

Solanum Dulcamara L. Climbing Nightshade. C.S.H. moist
banks.—N.M.G.

Solanum nigrum L. Deadly Nightshade. Vicinity Biological
Laboratory.—G.H.H.

Solanum tuberosum L. Potato. Jones Marsh, C.S.H.—G.
H.H.

SCROPHULARIACEAE.

Agalinis maritima Raf. Sea-side Agalinis. Salt marsh, C.
S.H.—N.M.G.

Agalinis purpurea (L) Britton. Large Purple Agalinis.
Jones Marsh.—C.E.

Antirrhinum majus L. Great Snap-dragon. Cultivated, es-
caped. C.S.H.—N.M.G.

- Castilleja coccinea* (L) Spreng. Indian Paint-brush. Oyster Bay.—Jelliffe.
- Chelone glabra* L. Turtle head. C.S.H. Swamps, and clay streams.—J.A.H.
- Cymbalaria Cymbalaria* (L) Wettst. Kennilworth Ivy. Vicinity C.S.H.—N.M.G.
- Dasytoma flava* (L) Wood. Downy False Foxglove. C.S.H. Hillside.—N.M.G.
- Dasytoma pedicularia* L. Fever-Weed. Pine Barrens, L. I.—N.M.G.
- Digitalis purpurea* L. Purple Foxglove. Cultivated and escaped.—G.H.H.
- Gratiola aurea* Muhl. Goldenpert. C.S.H., edge 1st lake.—C.E.
- Leptandra virginica* (L) Nutt. Beaumont's-root. Common throughout island.—Jelliffe.
- Limosella aquatica* L. Mudwort. C.S.H. sea wall.—J.W.H.
- Linaria canadensis* (L) Dumont. Blue Toad-Flax. Hempstead Plains, Hicksville, L. I.—N.M.G.
- Linaria Linaria* (L) Karst. Butter-and-Eggs. Vicinity C.S.H.—N.M.G.
- Melampyrum lineare* Lam. Narrow-leaved Cow-Wheat. Beach at Bayville, L.I.—N.M.G.
- Mimulus ringens* L. Square-stemmed Monkey-flower, C.S.H.—O.E.J.
- Paulownia tomentosa* (Thunb) Baill. Paulownia. Jones Farm, C.S.H.—O.E.J.
- Pedicularis canadensis* L. Wood Betony. Hempstead Plains, Hicksville, L. I.—N.M.G.
- Scrophularia marylandica* L. Maryland Figwort. Woods and thickets, C.S.H.—N.M.G.
- Verbascum Blattaria* L. Moth Mullen. C.S.H. Waste places, woodsides.—N.M.G.
- Verbascum Thapsus* L. Great Mullen. C.S.H. Sandspit.—N. M.G.
- Veronica agrestis* L. Garden Speedwell. Glen Cove.—Jelliffe.
- Veronica americana* Schwein. American Brooklime. Vicinity C.S.H.—G.H.H.
- Veronica arvensis* L. Corn Speedwell. Common throughout island.—Jelliffe.

Veronica officinalis L. Common Speedwell. Vicinity C.S.H.—
N.M.G.

Veronica peregrina L. Purslane. Speedwell. Common
throughout island.—Jelliffe.

Veronica serpyllifolia L. Thyme-leaved Speedwell, St. John's
Lake.—Jelliffe.

LENTIBULARIACEAE.

Utricularia gibba L. Humped Bladderwort. C.S.H. vicinity,
2nd lake.—N.M.G.

Utricularia macrorhiza. Le Conte. Greater Bladderwort.
Swamp near 2nd lake, C.S.H.—N.M.G.

OROBANCHACEAE.

Leptamnium virginianum (L) Raf. Beech-drops. C.S.H.
vicinity—D.S.J.

Thalesia uniflora Brit. Pale Broom-rape. C.S.H. vicinity.—
J.A.H.

BIGNONIACEAE.

Bignonia radicans (L) Trumpet-flower. Vicinity C.S.H.—
N.M.G.

Catalpa Catalpa. Warder. Catalpa. Cultivated C.S.H.—N.
M.G.

PHRYMACEAE.

Phryma Leptostachya L. Lopseed. C.S.H. roadsides.—G.
H.H.

PLANTAGINACEAE.

Plantago aristata Michx. Large-bracted Plantain, C.S.H.—
N.M.G.

Plantago lanceolata L. Ribgrass. Roadsides, C.S.H.—N.M.G.

Plantago major L. Common Plantain. Roadsides, C.S.H.—
N.M.G.

Plantago maritima L. Seaside Plantain. Salt marshes, C.S.
H., H.H.Y. and O.S.J.

Plantago Rugelii Dene. Regel's Plantain. Jones Marsh, C.S.
H.—C.E.

Plantago virginica L. Dwarf Plantain. Jones Marsh, C.S.
H.—C.E.

RUBIACEAE.

Cephalanthus occidentalis L. Button-bush. Kettle hole near
Jericho, L. I.—J.W.H.

- Diodia teres* Walt. Rough Buttonweed. Vicinity C.S.H.—G.H.H.
- Galium Aparine* L. Cleavers. Coppice, Jones Marsh.—G.H.H.
- Galium asprellum* Michx. Rough Bedstraw. Oyster Bay.—Jelliffe.
- Galium circaezans* Michx. Wild Liquorice.—G.H.H.
- Galium Claytoni* Michx. Clayton's Bedstraw. Salt Marsh, C.S.H.—H.S.C.
- Galium Mollugo* L. White Bedstraw. Hill road to Huntington. C.S.H.—N.M.G.
- Galium tinctorium* L. Wild Madder. Oyster Bay.—Jelliffe.
- Galium trifidum pusillum* L. Small Bedstraw. Pine Barrens, L.I.—N.M.G.
- Galium triflorum* Ait. Sweet-scented Bedstraw. Vicinity C.S.H.—N.M.G.
- Galium verum* L. Yellow Bedstraw. Huntington Hill Road.—G.H.H.
- Houstonia coerulea* L. Bluets.—Jelliffe.
- Houstonia longifolia* Gaertn. Long-leaved Houstonia. C.S.H. Hempstead Plains, Hicksville, N. Y.—N.M.G.
- Mitchella repens* L. Partridge Berry. De Forest Estate.—G.H.H.

CAPRIFOLIACEAE.

- Lonicera japonica* Thunb. Japanese Honeysuckle. C.S.H.—N.M.G.
- Lonicera sempervirens* L. Coral Honeysuckle. Woods, C.S.H.—G.H.H.
- Sambucus canadensis* L. American Elder. Roadsides, C.S.H.—N.M.G.
- Symporicarpos racemosus* Michx. Snowberry. C.S.H., roadsides.—N.M.G.
- Triosteum aurantiacum* Bicknell. Scarlet-fruited Horse Gentian. Hempstead Plains, Hicksville, L. I.—N.M.G.
- Triosteum perfoliatum* L. Feverwort. Oyster Bay, Glen Cove, L. I.—Jelliffe.
- Viburnum acerifolium* L. Maple-leaved Arrow-wood. Moist Woods, C.S.H.—N.M.G.
- Viburnum cassinoides* L. White-rod. Swamps, C.S.H.—J.A.H.

Viburnum dentatum L. Arrow-wood. Huntington Hill Road,
C.S.H.—N.M.G.

DIPSACACEAE.

Dipsacus sylvestris L. Wild Teasel. C.S.H.—Jelliffe.

CUCURBITACEAE.

Sicyos angulatus L. Star Cucumber. Jones Woods. C.S.H.—
G.H.H.

CAMPANULACEAE.

Campanula rapunculoides L. Creeping Bellflower. C.S.H.
village and vicinity.—N.M.G.

Specularia perfoliata (L) A. DC. Venus Looking-glass, C.
S.H. vicinity.—N.M.G.

LOBELIACEAE.

Lobelia cardinalis L. Cardinal-flower. C.S.H. vicinity.—N.
M.G.

Lobelia inflata L. Indian Tobacco. Road to Sandspit, C.S.H.
—N.M.G.

Lobelia Nuttallii R. & S. Nuttall's Lobelia.—Jelliffe.

Lobelia spicata Lam. Pale Spiked Lobelia. Hempstead Plains,
Hicksville, L. I.—N.M.G.

Lobelia syphilitica L. Great. Lobelia, Oyster Bay, L. I.—
Jelliffe.

CICHORIACEAE.

Apargia nudicaulis (L) Britton. Hairy Hawkbit. C.S.H.—
Jelliffe.

Cichorium Intybus L. Chicory. Vicinity C.S.H.—N.M.G.

Cynthia virginica (L) D. Don. Cynthia. Glen Cove.—Jil-
liffe.

Hieracium aurantiacum L. Orange Hawkweed. Pine Bar-
rens, St. James, L. I.—N.M.G.

Hieracium canadense Michx. Canada Hawkweed, C.S.H.
vicinity.—J.A.H.

Hieracium Granovii L. Hairy Hawkweed. Common through-
out island.—Jelliffe.

Hieracium Marianum Willd. Maryland Hawkweed. Vicinity
C.S.H.—J.A.H.

Hieracium murorum L. Wall Hawkweed. Northport, L. I.
—Jelliffe.

- Hieracium paniculatum* L. Paniced Hawkweed. Vicinity C. S.H.—J.A.H.
- Hieracium scabrum* Michx. Rough Hawkweed. Vicinity C. S.H.—J.A.H.
- Hieracium venosum* L. Rattlesnake-weed. Vicinity C.S.H.—J.A.H.
- Iva frutescens* L. Marsh Elder. C.S.H. vicinity, salt marshes.—Jelliffe.
- Krigia virginica* (L) Willd. Carolina Dwarf Dandelion. Oyster Bay.—Jelliffe.
- Lactuca canadensis* L. Wild Lettuce. Vicinity C.S.H.—Jelliffe.
- Lactuca saligna* L. Willow Lettuce. Woods C.S.H.—Jelliffe.
- Lactuca spicata* (Lam) Hitchc. Tall Blue Lettuce. Jones Marsh, C.S.H.—Jelliffe.
- Lactuca virosa* L. Prickly Lettuce. Vicinity C.S.H.—Jelliffe.
- Lapsana communis* L. Succory Dock-cress. Road to Sandspit, C.S.H.—Jelliffe.
- Leontodon Taraxacum* L. Dandelion. Vicinity C.S.H.—Jelliffe.
- Nabalus albus* (L) Hook. Rattlesnake-root. Common throughout island.—Jelliffe.
- Nabalus altissimus* (L) Hook. Tall White Lettuce. Common L.I.—Jelliffe.
- Nabalus racemosus* (Michx.) D.C. Glaucous White Lettuce. Not infrequent on L. I.—Jelliffe.
- Sonchus arvensis* L. Corn-Thistle. C.S.H.—Jelliffe.

AMBROSIAEAE.

- Ambrosia elatior* L. Wild Tansy. E. Shore, C.S.H.—Jelliffe.
- Ambrosia trifida* L. Great Ragweed.—Jelliffe.
- Xanthium americanum* Walt. American Cocklebur. Common throughout island.—Jelliffe.
- Xanthium commune* Britton. Cocklebur. Vicinity C.S.H.—Jelliffe.
- Xanthium pennsylvanicum* Wallr. Pennsylvania Clotbur.—Jelliffe.
- Xanthium spinosum* L. Spiny Clotbur. Common throughout island.—Jelliffe.

COMPOSITAE.

- Achillea Millefolium* L. Yarrow. C.S.H.—N.M.G.
Anaphalis margaritacea (L) B. & H. Pearly Everlasting,
Pine Barrens, St. James, L. I.—N.M.G.
Antennaria neglecta Greene. Field Cat's-foot. Syosset.—H.
S.C.
Antennaria neodioica Greene. Smaller Cat's-foot. C.S.H.
vicinity.—N.M.G.
Antennaria plantaginifolia (L) Richards. Plantain-leaf.
Everlasting. Vicinity C.S.H.—J.A.H.
Anthemis arvensis L. Corn Camomile. C.S.H.—G.H.H.
Anthemis Cotula L. Dag's Camomile. C.S.H.—G.H.H.
Arctium Lappa L. Great Bur. Vicinity C.S.H.—N.M.G.
Arctium minus Bernh. Common Burdock. Jones marsh,
Vicinity C.S.H.—G.H.H.
Artemisia caudata Michx. Tall Wormwood, C.S.H.—Jelliffe.
Artemisia Stelleriana Bess. Beach Wormwood. Bayville, L.
I.—N.M.G.
Artemisia vulgaris L. Common Mugwort, C.S.H.—Jelliffe.
Aster acuminatus Michx. Whorled Aster.—Jelliffe.
Aster cordifolius L. Common Blue Wood Aster. C.S.H.—J.
A.H.
Aster divaricatus L. White Wood Aster, Vicinity C.S.H.—
J.A.H.
Aster dumosus L. Bushy Aster. Vicinity C.S.H.—J.A.H.
Aster ericoides L. White Heath Aster. Vicinity C.S.H.—J.
A.H.
Aster Herveyi Gray. Hervey's Aster. C.S.H.—N.M.G.
Aster laevis L. Smooth Aster. Oyster Bay.—Jelliffe.
Aster lateriflorus Britton. Starved Aster. Vicinity C.S.H.—
J.A.H.
Aster macrophyllus L. Large-leaved Aster. Oyster Bay.—
Jelliffe.
Aster multiflorus Ait. Dense-flowered Aster.—Jelliffe.
Aster novae-angliae L. New England Aster.—Jelliffe.
Aster novae-belgii L. New York Aster. Fern Belt. Marsh.
—H.S.C.
Aster parvifolius Lam. Tall White Aster. Vicinity C.S.H.
—J.A.H.

- Aster paniculatus acutidens* Burgess. Vicinity C.S.H.—J. A.H.
- Aster patens* Ait. Late Purple Aster. Vicinity C.S.H.—J. A.H.
- Aster puniceus* L. Red-stalk Aster. Vicinity C.S.H.—J.A.H.
- Aster subulatus* Michx. Annual Salt Marsh Aster. Salt marsh, C.S.H.—N.M.G.
- Aster salicifolius* Lam. Willow Aster Vicinity C.S.H.—J.A.H.
- Aster tenuifolius* L. Perennial Salt-marsh Aster. Marsh, C. S.H.—Jelliffe.
- Aster tradescanti* L. Michaelmas Daisy. Common throughout island.—Jelliffe.
- Aster undulatus* L. Wavy-leaf Aster.—J.A.H.
- Aster vimineus* Lam. Small Aster. Vicinity C.S.H.—J.A.H.
- Baccharis halimifolia* L. Groundsel-tree. Gilgo Beach, L.I. —N.M.G.
- Bidens bipinnata* L. Spanish Needles. Vicinity C.S.H. — G.H.H.
- Bidens connata* Muhl. Purple stemmed Swamp Beggar Ticks. Common throughout island.—Jelliffe.
- Bidens cernua* L. Smaller Bur-Marigold. C.S.H.—G.H.H.
- Bidens frondosa* L. Beggar-ticks. Roadsides, C.S.H.—G.H.H.
- Centaurea Cyanus* L. Corn Flower. Havemeyer Estate near Oyster Bay, L. I.—G.H.H.
- Centaura nigra* L. Black Knapweed. Near R.R. Depot, C.S. H., L. I.—G.H.H.
- Chrysanthemum Parthenium* L. Feverfew. Matheson Estate, C.S.H.—G.H.H.
- Chrysanthemum Leucanthemum* L. Ox-eye Daisy. Roadsides, fields, C.S.H.—G.H.H.
- Chrysopsis mariana* L. Maryland Golden Aster. Pine Barrens near L. Ronkonkema, L. I.—N.M.G.
- Chrysopsis falcata* (Pursh) Ell. Sickle-leaved Golden Aster. Sandy Soil, Bayville, L. I.—N.M.G.
- Cirsium arvense* L. Scop. Canada Thistle. Common throughout island.—Jelliffe.
- Cirsium discolor* (Muhl) Spreng. Field Thistle. Hempstead Plains, Hicksville, L. I.—N.M.G.

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- Cirsium horridulum* Michx. Yellow Thistle. Oyster Bay.—
Jelliffe.
Cirsium lanceolatum L. Common Bur. Vicinity, C.S.H.—N.
M.G.
Cirsium odoratum (Muh) Porter. Fragrant thistle. C.S.H.—
N.M.G.
Coreopsis tinctoria Nutt. Golden Coreopsis. Cultivated, C.
S.H.—J.H.H.
Dahlia pinnata Cav. Escaped from cultivation.—C.E.
Doellingeria umbellata (Mill.) Nees. Tall Flat-top Aster.
Oyster Bay, L. I.—Jelliffe.
Erechtites hieracifolius (L) Raf. Fire-weed. Salt Marsh,
C.S.H.—H.S.C.
Erigeron annuus (L) Pers. Sweet Scabious. C.S.H., fields.
—N.M.G.
Erigeron philadelphicus L. Philadelphia Fleabane. Oyster
Bay, L. I.—Jelliffe.
Erigeron pulchellus Michx. Robin's Plantain. C.S.H.—N.
M.G.
Erigeron ramosus Walt. Daisy Fleabane. Vicinity C.S.H.
—N.M.G.
Eupatorium hyssopifolium L. Hyssop-leaved Thoroughwort.
Vicinity C.S.H.—N.M.G.
Eupatorium perfoliatum L. Boneset. Salt Marsh, C.S.H.—
N.M.G.
Eupatorium purpureum L. Joe-Pye Weed. Roadsides, C.S.H.
—N.M.G.
Eupatorium sessilifolium L. Upland Boneset. Glen Cove;
Oyster Bay.—Jelliffe.
Eupatorium urticaefolium Reichard. White Snake-root. Oyster
Bay.—Jelliffe.
Euthamia graminifolia (L) Nutt. Bushy Golden rod. Up-
per Marsh near Fish Hatchery.—J.A.H.
Euthamia tenuifolia L. Greene. Slender Fragrant Golden
rod. Syosset,—H.S.C.
Galinsoga parviflora (Cav) Galinsoga. Fields, waste places,
C.S.H.—N.M.G.
Gnaphalium Helleri. Britton. Heller's Everlasting. C.S.H.—
Jelliffe.

- Gnaphalium obtusifolium* L. Sweet Everlasting. Common throughout island.—Jelliffe.
- Gnaphalium uliginosum* L. Mouse-ear. Common throughout island.—Jelliffe.
- Helenium autumnale* L. False Sunflower. Common throughout island—Jelliffe.
- Helianthus angustifolius* L. Narrow-leaved Sunflower. Oyster Bay—Jelliffe.
- Helianthus annuus* L. Upper Marsh, C.S.H.—Jelliffe.
- Helianthus divaricatus* L. Rough Sunflower. Common throughout island.—Jelliffe.
- Helianthus giganteus* L. Tall Sunflower. Lloyds point; C.S.H.—N.M.G.
- Helianthus strumosus* L. Pale-leaved Wood Sunflower. Hempstead Plains, Hicksville, L. I.—N.M.G.
- Heliopsis scabra* Dunal. Rough Ox-eye. Vicinity C.S.H.—G.H.H.
- Inula Helenium* L. Elecampane. Oyster Bay, L. I.—Jelliffe.
- Ionactis linariifolius* (L) Greene. Stiff Aster. Syosset.—H.S.C.
- Lacinaria scariosa* (L) Hill. Large Button-Snakeroot. Common L. I.—Jelliffe.
- Leptilon canadense* Britton. Canada Fleabane. Vicinity Biological Lab. C.S.H.—N.M.G.
- Matricaria matricarioides* (Less.) Porter. Rayless Camomile. Hempstead Plain, Hicksville, L. I.—N.M.G.
- Mikania scandens* (L) Willd. Climbing Hempsweed. Frequent, L. I.—Jelliffe.
- Nabalus trifoliolatus* Cass. Tall Rattlesnake-root. Road to Eugenics Record Office, C.S.H.—N.M.G.
- Pluchea camphorata* L. Spicy Fleabane. Salt marsh, C.S.H.—N.M.G.
- Rudbeckia hirta* L. Black-eyed Susan. Hempstead Plain, Hicksville, L. I.—N.M.G.
- Senecio aureus* L. Golden Ragwort. Common throughout island.—Jelliffe.
- Senecio vulgaris* L. Common Groundsel, C.S.H.—Jelliffe.
- Sericocarpus asteroides* (L) B.S.P. Toothed White-topped Aster. Near 1st lake, C.S.H.—N.M.G.

- Sericocarpus linifolius* L. Narrow-leaved White-topped Aster.
Hempstead Plains, Hicksville, L. I.—N.M.G.
- Solidago bicolor* L. White Golden rod. Vicinity C.S.H.—J.
A.H.
- Solidago caesia* L. Blue-stemmed Goldenrod. Vicinity C.S.H.
—J.A.H.
- Solidago canadensis* L. Canada Goldenrod. Vicinity C.S.H.—
N.M.G.
- Solidago flexicaulis* L. Broad-leaved Goldenrod. Oyster Bay,
L. I.—Jelliffe.
- Solidago juncea* Ait. Early Goldenrod. Vicinity C.S.H. —
J.A.H.
- Solidago nemoralis* Ait. Dwarf Goldenrod. Vicinity C.S.H.
—N.M.G.
- Solidago odora* Ait. Sweet Goldenrod. Pine Barrens near St.
James, L. I.—N.M.G.
- Solidago rugosa* Mill. Pyramid Golden Rod. Vicinity C.S.
H.; Syosset, L. I.—H.S.C.
- Solidago sempervirens* L. Seaside Goldenrod. Salt Marsh,
C.S.H.—Jelliffe.
- Solidago serotina* Ait. Late Goldenrod. Oyster Bay.—Jel-
liffe.
- Sonchus asper* (L) Hill. Spiny Sow-thistle. Vicinity C.S.H.
—Jelliffe.
- Tanacetum vulgare* L. Tansy. C.S.H.—N.M.G.
- Veronia noveboracensis* (L) Willd. New York Ironweed.
Jones Marsh; Roadsides, C.S.H.—J.H.H.

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HIBERNATION AND REJUVENATION, EXEMPLIFIED BY NORTH AMERICAN HERBS.

THEO. HOLM.

(With five plates drawn from nature by the author.)

Rejuvenation is generally preceded by hibernation so far as concerns the perennial herbs, and some few, which typically are not perennial, but which occasionally may persist for two or three years. The method of rejuvenation may be indicated, however, already at the seedling-stage during the first season. The stage of hibernation may be represented by aerial or subterranean structures, notably by the latter.

The first hibernation is frequently an illustration of the future habit of the species with regard to the development of the various organs, which are needed for securing a vegetative reproduction, the fundamental structure by which the plant acquires the power of rejuvenation. The hibernation, including the protection of the plant so as to resist the cold, and at the same time securing the persistence of the individual by the accumulation of food-substances, in roots, stems or leaves, is effected by manifold structures, peculiar to a number of genera, or only to certain species. Structures exactly uniform are characteristic of only a relatively small number of families. If these various structures had been studied in the North American plants especially, they would constitute a valuable characterization of genera and species in connection with the well known floral and foliar. The study of vegetative reproduction, however, is sometimes a difficult subject; it may require no small amount of observation, and for quite a considerable time.

Hibernation and rejuvenation thus constitute two phases of plant-life, illustrating in a remarkably clear manner the power of the plant to adapt itself to the environment in conformity with its requirements for existence. The numerous and highly diversified structures observed in this particular

respect may well be regarded as a result of the combined efforts of the plant to resist and conquer in the struggle for its existence, within certain limits beyond which its vitality becomes menaced. Some certain external structures in the line of vegetative reproduction, for instance in the development of the root-system and the subterranean stem are fixed and absolutely constant in a number of genera and species; they are frequently accompanied by internal structures, which are equally fixed and constant in many families. These external and internal peculiarities may thus both represent fixed characters, but the internal especially are often accompanied by such modifications, which depend on the nature of the environment, the epharmonic. Many, if not most of the epharmonic structures appear, however, in a very regular manner and, to a great extent, in strict conformity with the plasticity of the species. The combination of these vegetative structures with those pertaining to the floral reproduction "in toto," may be considered as an expression of some kind of individuality possessed by the plants. Hibernation and rejuvenation, giving us a picture of the beginning and final structures of the vegetative organs, contain many points in favor of a striking, adaptive power of the plants, which appear far beyond any simply forced adaptation, forced upon the plant by the environment alone.

While the very first period of the seedling-stage is not marked by many structural, principally external, differences, the autumnal stage is the one, where the morphological peculiarities of the perennial species begin to appear, preparing for the first hibernation and succeeding rejuvenation. We know that the majority of the dicotyledonous plants germinate with epigeic cotyledons, and that the shape of the cotyledons is remarkably uniform in numerous genera, besides that the structure of the hypocotyl and the primary root is very uniform; in some few Dicotyledones the cotyledons are hypogaeic, free or remaining enclosed within the seed. In the Monocotyledones the cotyledon is hypogaeic in all the *Gramineae* and *Cyperaceae*, and epigeic only in some relatively few genera of the other families. Characteristic of all the *Orchidaceae* is the development of the non-differentiated embryo into a small tuberous body, at the apex of

which the rudimentary cotyledon subtends the plumule. The uniformity in structure during the first period of the seedling-stage in the Dicotyledones disappears sooner or later during the summer, when the stem with the roots begin to increase in length and thickness according to the habit of the species. There is, however, a wide gap between germination and the first hibernation. The possibility of the seeds to strike ground suitable to their germination is in many plants very limited, some being more particular in this respect than others, and some requiring several years before they are able to germinate. But even if the seeds manage to germinate, the first summer is a most critical period for these to develop further. We are speaking of perennial herbs only, and we have noticed for many years how very few seedlings of certain species survive the first summer; very many succumb, becoming, so to speak, crowded out by the numberless annuals, or destroyed by unfavorable climatologic conditions, droughts especially. But those that manage to pull through the summer, and to reach the autumnal stage, these are safe, and capable of persisting through the winter, buried in the soil or covered by fallen leaves. The first sign of rejuvenation proves their vitality, and from that time the danger of becoming arrested in their development is much lessened. The various factors important to the seed to germinate, to the seedling to become prepared for the first hibernation, these factors, though essentially the same, may exercise an influence of highly different extent upon the various plants. Therefore we observe certain species to be remarkably resistant to the influence of climate and soil, thus their seedlings may be found in numbers, and the species growing in abundance, owing to the germinative power of the seed, and the strength of the seedling to continue its growth undisturbed. The social, the abundant occurrence of certain species, may sometimes not depend upon the germination of many seeds, but simply upon the original establishment of some few individuals of which the vegetative reproduction is effected by runners, stolons, or root-shoots.

The very first indication of the species to become perennial is exemplified by various modifications in the structure

of the seedling. Among the Dicotyledones an early appearance of secondary tissues in the primary root is a sure sign (certain *Umbelliferae*, *Claytonia*, *Panax*, *Galactia*); moreover the early development of a secondary root-system at the expense of the hypocotyl and the primary root (*Ranunculus*, *Dionaea*). An early increase in thickness of the hypocotyl (*Scrophularia*, *Collinsonia*, *Sanguinaria*); the appearance of cotyledonary buds (*Triadenum*, many *Labiatae*, *Leguminosae*), which generally remain dormant during the first season; the development of the primary shoot into a bulb or a tuber (*Dentaria bulbifera*, *D. laciniata*); the persistence of some of the basal internodes and buds of the primary shoot (*Phryma*, *Hypericum*), or finally, by an early appearance of buds upon the lateral roots (*Rhexia*).

Among the Monocotyledones the future perennial growth is marked by only a few distinct structures owing to the complete absence of secondary tissues in the roots, as well as the frequent non-development of a hypocotyl. But the early increase in thickness of the primary axis so as to form a tuber (*Arisaema*, *Dioscorea*) or a bulb indicates a perennial habit. In the perennial *Gramineae*, *Cyperaceae* and *Juncaeeae* the leaves developed during the first summer subtend buds, which winter over and develop during the succeeding spring into stolons or ascending shoots. These various structures thus represent the foundation of vegetative reproduction, and they are constant and characteristic of a number of genera and species.

The rejuvenation appears in conformity with these structures, and especially in accordance with the function of the hibernating buds to develop as an ascending, aerial shoot, as runners or as subterranean stolons. An aerial shoot, frequently purely vegetative for some years, or a single green leaf may be the first sign of rejuvenation, but generally accompanied by subterranean structures such as rhizomes, tubers, bulbs or even root-shoots, for the duration of the species may be prolonged by means of the roots, when the primary axis does not persist for more than one season (*Rhexia*), or for two years (*Strophostyles*). Rejuvenation in the manner of a purely vegetative shoot, vegetative for several years, is characteristic of *Gramineae*, *Cyperaceae*, *Jun-*

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caceae, and also of many Dicotyledones of the various families. The development of a single, green leaf may be observed in several Monotyledones: *Smilacina*, *Oakesia*, *Medeola* etc., and in a number of Dicotyledones with rhizomes viz: *Podophyllum*, *Sanguinaria*, *Jeffersonia*, *Dentaria* etc., or with tuberous roots viz: *Panax*, many *Umbelliferae* etc.

While thus the structure of the seedlings at the very earliest stage is strikingly uniform in many species, genera and even families, mono- as well as dico-tyledonous, the withering of the cotyledons marks a new period of growth resulting in structures of great diversity in accordance with the requirements of the plant, when preparing for the first hibernation. The first rejuvenation shows us in the structure of the subterranean part of the primary shoot, how the final habit will be, and not infrequently axes of secondary order may also begin to appear at this stage, in the form of runners, stolons, tubers, etc. But such conformity does not exist, when we examine the possible correlation between the development of the plant-organs, combined with each other. For the development of the primary root as a large storage-root may be accompanied by a single leaf for several years (*Eriogonum*, *Archemora*), by a small rosette of leaves (*Claytonia*), or by a vegetative shoot as in *Galactia*. The swollen hypocotyl may be accompanied by a single leaf for several years (*Sanguinaria*), or by a vegetative shoot (*Scrophularia*, *Collinsonia*). The young rhizome, as it appears during the first period of rejuvenation, may develop a single leaf in *Podophyllum*, *Jeffersonia*, *Dentaria*, *Smilacina*, or a vegetative shoot as in *Leptandra*, *Lysimachia*. Finally the tubers and the bulbs may represent the axis of first order, the primary, or they may be axillary, sessile or terminating long stolons, as the tubers in *Hydrocotyle Americana*, *Scutellaria parvula*, *S. lateriflora*, *Stachys*, and the bulbs in *Claytonia Chamissonis*, *Oxalis violacea* etc.

Another peculiarity, which shows a corresponding independence of these structures, consists in the foliage of certain plants to remain fresh and green throughout the winter, although they are not of the evergreen type. While several of the perennial herbs disappear from the surface of the soil so soon as the fruits have matured, as early as during the

first part of the summer (*Dicentra*, *Dentaria*, *Anemone*, *Erythronium*), some others, and very many indeed, may be observed to hibernate with some aerial leaves, remaining green and active throughout the winter. Among these are species of strikingly different habits: nearly all the *Gramineae*, notably *Panicum*, of which the overwintering leaves are much smaller, but of a much firmer structure than those developed in the spring; all the *Carices*, *Iris*, *Rumex*, *Stellaria*, *Hepatica*, *Thalictrum*, *Viola* (many species), *Linum*, *Hypericum*, *Oxalis*, *Geum*, *Fragaria*, *Potentilla*, *Phlox subulata*, *Gratiola*, *Glechoma*, and many *Compositae*, notably *Arnica*, *Antennaria*, *Aster*, *Solidago* etc.

These various structures briefly described above, thus indicate the duration of the plants to extend for several years, and the growth from the seedling-stage to the first rejuvenation incl. corresponds sometimes with the one, which characterizes the biennials. The life of the biennials comprises a purely vegetative stage during the first season, from the germination to the hibernation incl., and a mostly purely floral in the second season, the rejuvenation, followed by the death of the individual. In several of the biennial plants the primary root develops as a strong tap-root, accompanied by a corresponding growth of the hypocotyl, while the aerial shoot, during the first season, remains extraordinarily short, unbranched, with the crowded leaves forming a rosette, persisting in a fresh condition through the winter (*Arabis laevigata*, many *Compositae* etc.), or withering at the close of the first season (*Lappa* according to Warming.) The rejuvenation is marked by the development of a floral shoot with stretched internodes, more or less leafy, and frequently even ramified (*Cynoglossum*, *Onosmodium* etc.) Some of the biennials imitate the annuals by a feeble development of the primary root, and by a very early flowering (*Draba verna*, *Cerastium viscosum* L., *C. vulgatum* L. etc.) With exception of some cultivated grasses, no biennials are known among the Monocotyledones. The development of a tap-root and a hibernating rosette of leaves is, as shown in the preceding, characteristic of several perennials, but in these the first floral stage may not appear already in the second year, but several years afterwards, and the floral stage may become

repeated every year so long as the individual persists. Moreover the perennials are frequently capable of producing a secondary root-system from the basal internodes, already during the first season, which does not occur in the biennials.

Transitions from the annual to the biennial type are known, and several cases have been described by Irmisch and Hildebrand, notably among the *Cruciferae*, *Compositae*, and cultivated *Gramineae*; *Echinospermum Lappula* occurs as annual and biennial (Irmisch), and the habit is quite different; the annual specimens develop no rosette of leaves, and the caulin are only a few; annual specimens of *Hyoscyamus niger* have been described as a distinct species: *H. agrestis*. Alexander Braun has made the interesting statement, that hybrids of biennials may become perennial by the development of shoots, because the sexual reproduction is inferior.

Furthermore certain apparently annual plants may be difficult to classify in this respect. Irmisch observed that in *Melilotus officinalis*, *M. albus* and *M. macrorrhizus* the primary shoot is tall, purely vegetative and dies down to the ground at the close of the first season, but leaving the hypocotyl and the cotyledonary buds intact; during the following spring these buds develop into floral shoots, and the individual dies immediately after the maturing of the fruits. *Strophostyles umbellata* (Muehl.) Britton grows in the same manner, but lives one year longer, since the primary root with its ramifications produces many shoots in the third season, of which several reach the flowering stage, but wither completely after the maturing of the seeds; we observed as many as 17 shoots developed on one single, lateral root, but those (three to five) that were developed from the primary root, were much stronger.

Transitions from annual to perennial seem to be more frequent, and several cases have been recorded. According to Scott Elliot (fide Henslow l. c.) certain European annuals of cultivation have become perennials in South Africa. The Stock and the Mignonette were by I. O. Hooker observed to be perennial in Tasmania. De Vries mentions *Phaseolus multiflorus* as being typically an annual, but that it sometimes produces a tuberous root, which may winter over and enable the plant to become perennial; furthermore that a per-

ennial variety of rye is cultivated in Russia. Irmisch observed *Hypericum humifusum* and *Malva neglecta* to occur as both perennials and annuals, although they are typically annuals. From this continent we have reported *Cyperus flavescens* L., *Tragus racemosus* Hall., *Delphinium Consolida* L., *Hypericum nudicaule* Walt., and *Arabis lyrata* L. as being perennial in certain localities, and more recently we have found many perennial specimens of *Hypericum Canadense* L. and *H. muticum* L. (Fig. 46.) It would thus appear as if the typically annual species of *Hypericum* show a tendency to become perennial. A corresponding variation from annual to perennial occurs also in *Linum Virginianum* L., where small vegetative shoots appear late in the fall, and persist through the winter. We have thus arrived at the question, how the perennial habit is actually effected, and how such habit may be traced to the seedling-stage during the first summer and be continued during the first hibernation until rejuvenation begins. The methods by which it is effected are very distinct, and it would be a very difficult task to combine them in the manner of classification. We, therefore, prefer to describe some of the most characteristic methods independently of each other, but, so far as possible, in accordance with the organs, which are the most active and influential with respect to enabling the species to become perennial. As mentioned in the preceding pages these organs may be: (1) the primary root, (2) the secondary root-system, (3) the hypocotyl, (4) the cotyledonary buds, (5) the plumule and, though seldom, the early development of buds upon the lateral roots.

I.—THE PRIMARY ROOT.

Eriogonum bulbosa Nutt. (Fig. 1) represents the very simplest type of a perennial herb, since the primary root persists through the whole life of the individual, and since no secondary roots become developed; moreover because the hibernating stage shows only the root and a bud, from which the aerial stem or stems become developed. The seedling has only one cotyledon, epigeic and with a long, slender petiole; the primary root represents a small tuberous body taper-

ing gradually into a filiform, unbranched apex. At the close of the first season the only part that persists is the small, globose base of the root (the primary) bearing a minute bud, covered by a scale-like leaf. The first rejuvenation takes place in the very early succeeding spring, and this stage is marked by a single aerial leaf with a long petiole and a ternately divided blade; some few short, slender lateral roots have developed from the primary. For five or six years the hibernation and rejuvenation show the same structure, with the only differences that the number of scale leaves becomes increased to three, and that the aerial leaf attains the same size and shape as the later developed cauline. At the time of flowering a single, terminal stem develops from the bud, beside that some lateral (two or three) may appear from the axils of the scale-leaves. *Erigenia* is poly-
carpous.

Claytonia Virginica L. (Fig. 2). Likewise *Erigenia* the seedling has only one cotyledon and the long, primary root is swollen at the base; there is no hypocotyl. During the first season the base of the root increases rapidly in thickness, while the slender apical portion dies off before the first hibernation. The first hibernation is thus marked by only a small, roundish tuberous root and a bud from which a few leaves become developed at the first rejuvenation; the root shows then many transverse wrinkles, and several long, lateral roots become developed. Some three or four years elapse before the inflorescences appear; these are axillary, the small shoot thus representing a monopodium, but all the leaves fade away during the spring.

Calandrinia pygmaea Gray (Fig. 3) differs from *Erigenia* and the *Claytonia*, described above, by germinating with two cotyledons, and by the primary root becoming a deep, fleshy, and very thick taproot with many transverse wrinkles indicating its contractile power. The inflorescences do not appear until several years after the germination, and they all are axillary as in *Claytonia*.

Characteristic of these three plants is thus the persistence of the primary root, the non-development of the secondary roots, the absence of a hypocotyl, and the subterranean stem being only represented by extraordinarily short inter-

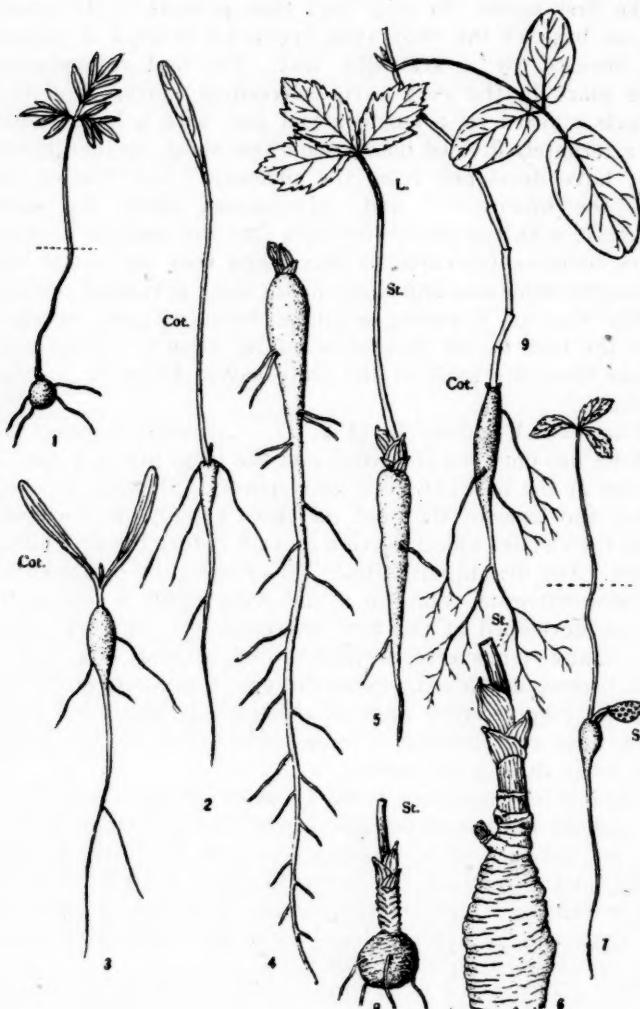


PLATE 1.

PLATE 1.

Fig. 1. *Erigenia bulbosa* Nutt. in the third year, showing the globose primary root with four slender branches, and the green leaf with a small, scale-like leaf at its base; natural size.

Figure 2. *Claytonia Virginica* L. Germination. Cot. = the cotyledon; natural size.

Figure 3. *Calandrinia pygmaea* Gray. Germination. Cot. = the cotyledons; enlarged.

Figure 4. *Panax quinquefolium* L. Hibernation; natural size.

Figure 5. Same species. Rejuvenation. St. = the stem with a leaf (L.) natural size.

Figure 6. Same species. Part of the rhizome of a mature specimen, showing the subterranean internodes, the base of the primary root, and the base of the aerial stem (St.); 2 \times natural size.

Figure 7. *Panax trifolium* L. Germination. S = the seed enclosing the cotyledons; 2 \times natural size.

Figure 8. Same species. The rhizome and the root of a mature specimen. St. = Base of the flowering stem; natural size.

Figure 9. *Galactia pilosa* Ell. Rejuvenation. Cot. = the scars of the cotyledons with the dormant buds; two-thirds of the natural size.

nodes. The monopodial structure of the shoot in *Claytonia Virginica* and *Calandrinia* recurs, however, in several of the other species of *Claytonia*, but of which the habit is very different.

A more advanced development of the primary root and the subterranean stem is to be observed in the following species of *Panax*.

Panax quinquefolium L. (Figs. 4-6). The seedling germinates with two hypogeeic cotyledons, and the primary root is a deep, swollen tap-root. A long-petioled leaf with an ample, ternate blade develops already during the first season, in the month of June; a small bud is visible at the base of this leaf, and remains dormant until next spring. At the first hibernation only the root and the bud persist. The first rejuvenation consists of the development of four scale leaves, exactly alternate, and a short, aerial stem bearing at its apex a bud and a ternate leaf with a distinct, but relatively short petiole. In mature specimens the root is quite large, sometimes more or less irregularly branched, and frequently with several long, slender ramifications. A short, vertical, but subterranean stem is now visible, and the scale leaves, three

to four, are exactly alternate; of these the two uppermost subtend small buds, the apical growing out to produce an aerial shoot, the basal remaining dormant. The root and the short, subterranean stem represent the stage of hibernation, the development of an aerial shoot marks the rejuvenation.

Panax trifolium L. (Figs. 7-8) shows at the seedling-stage the same type of root (the primary) as *Claytonia* (Fig. 2), while the two cotyledons are hypogeic, remaining enclosed within the seed. A green leaf with three leaflets appears already during the first season. At the stage of the first hibernation the filiform apex of the root has withered, and only a small, globular root with a bud persists through the winter. During the subsequent years the root retains its globular shape, and a small, vertical, subterranean stem with several scale-leaves, exactly alternate, become gradually developed. The root-system consists only of the primary and some few, slender lateral.

These two species of *Panax* have in common that the cotyledons (two) are hypogeic; that the primary root persists, but is of a different shape; that the aerial shoot is borne upon a vertical, but very short rhizome with scale-leaves, exactly alternate.

Galactia pilosa Ell. (Fig. 9). The cotyledons are hypogeic, and there is no hypocotyl; the primary root is developed as a tap-root already at the seedling stage. A small aerial, vegetative shoot appears during the first summer; it dies down to the ground during the fall, leaving only a few basal internodes and the root still active. The first rejuvenation depends upon the development of an aerial shoot from one of the axillary buds of the basal internodes, while the cotyledonary buds (Cot. in fig. 9) remain dormant; the primary root has now increased in thickness, and continues to do so until the death of the individual. No other root-system becomes developed in this species, and it is interesting to notice, that in the southern species *G. Elliottii* Nutt. the prostrate stems root freely at the nodes, the roots showing the same structure as the primary root of *G. pilosa*.

Archemora rigida DC. may also be referred to this type of perennials, although the primary root persists for only a

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few years, becoming replaced by a secondary system. Figure 10 shows a seedling, collected early in May. The primary root is long, very slightly swollen, and sparingly ramified. There is no hypocotyl; the cotyledons subtend no buds, and only one green leaf appears during the first summer. Secondary tissues have already begun to appear in the primary root, at this very early stage. During the first summer the primary root continues to increase in thickness, but only in the basal portion, close to the cotyledons, the long, slender apex withering gradually. The first hibernation is only marked by the persistence of the small, tuberous, primary root with a minute bud, covered by a scale-like, membranaceous leaf. The first rejuvenation is effected by the development of two green leaves, surrounded at the base by the scale-leaf, and furthermore by the development of a long, slightly swollen secondary root, proceeding from the very short internode beneath the scale-leaf; some few, mostly two, thin secondary roots have also been developed from the same place. The stage of germination, hibernation and rejuvenation thus show us a typical perennial plant with a hibernating bud and a system of storage roots (the primary and the secondary), which are contractile before the increase sets in. The individual remains purely vegetative for several years, presumably about 5 years. *Cicuta maculata* L. germinates in the same manner as *Archemora*.

The primary root thus plays a rôle of great importance to this group, even if it does not persist in *Archemora* and *Cicuta*; in all the others the primary root persists throughout the life of the plant. But characteristic of this group is the non-development of a hypocotyl, as well as the rhizome, being exceedingly short, when such is actually present. In *Archemora* and *Cicuta* the development of a secondary root-system makes an approach to the next group, where such system replaces the primary root already at the seedling-stage, besides that the hypocotyl, although well developed by the germination, fades away completely. So far as concerns the seedling-stage and the first hibernation *Archemora* and *Cicuta* belong naturally to the same group as *Erigenia* and the others. The first rejuvenation shows, on the other hand, the same peculiarities as are characteristic of the seedling

stage of the subsequent group, where a secondary root-system makes an early appearance.

II.—THE SECONDARY ROOT-SYSTEM.

A future perennial habit is shown by some plants by the very early development of a secondary system of roots, while the hypocotyl and primary root fade away completely. This structure is frequent and characteristic of most of the perennial Dicotyledones, which have only fibrous roots. *Ranunculus abortivus* L. may be selected as an example. The young seedling (Fig. 16) shows the common structure of seedlings in general: the long primary root, the distinct hypocotyl, and the plumule, having developed a small leaf. But a few weeks later we observe that the hypocotyl begins to bend towards the ground, and that secondary roots proceed from beneath the cotyledons, while several (4) green leaves have become developed from the plumule (Fig. 17). By following the further development of the seedling we notice a very

PLATE 2.

- Figure 10. *Archemora rigida* DC. Germination. Cot. = the cotyledons; R = the primary root; natural size.
- Figure 11. Same species. Rejuvenation; a specimen in its second year. R = the swollen, primary root; r. = secondary roots; natural size.
- Figure 12. Same species. Rejuvenation; a specimen in its third year. letters as above; enlarged.
- Figure 13. Same species. Hibernation; rhizome of a mature specimen with the roots and a large bud at the base of the aerial stem; natural size.
- Figure 14. *Cicuta maculata* L. Rejuvenation; rhizome of a mature specimen with the roots and the base of the flowering stem; natural size.
- Figure 15. Same species. Hibernation; a bud detached from the rhizome of an old specimen to produce a new individual; two thirds of the natural size.
- Figure 16. *Ranunculus abortivus* L. Germination; R = the primary root; Hyp. = the hypocotyl; cot. = the cotyledons; 3 X natural size.
- Figure 17. Same species. An older seedling; r = the first two secondary roots; other letters as above; 3 X natural size.

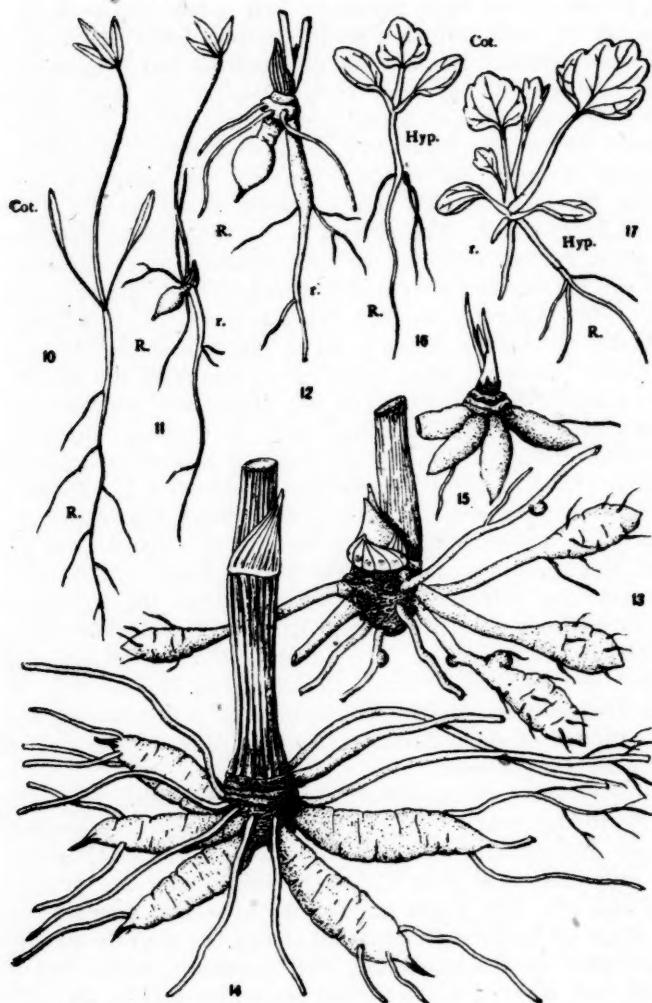


PLATE 2.

great change, since, as shown in figure 17, the hypocotyl and the primary root have begun to fade away, replaced by a new set of roots, which pull the young, leafy shoot down into the ground. As soon as the seedling has dropped the hypocotyl and the primary root, it shows the final vegetative habit: a rosette of leaves and fibrous roots. The foliage withers during the summer, but the root-system with a bud persists through the winter. During the following early spring the bud develops into a rosette of leaves and a terminal floral shoot. The species is not biennial as described by Gray, but perennial, as we have observed many specimens with an old flowering stem still attached from the preceding year. The rejuvenation then depends upon the development of buds in the axils of the basal leaves, and these buds may be readily observed, when the plant is maturing the fruits.

As stated above this type of vegetative reproduction, shown already at the seedling-stage, is common to many plants of different families, for instance several of the other species of *Ranunculus*, *Saxifraga Virginiana* L., *Dionaea*, *Sarracenia purpurea* L., *Sanicula* etc. They are plants of a cespitose habit with the leaves forming a more or less distinct rosette, and with numerous fibrous roots. In *Dionaea*, however, the primary axis is creeping, but the internodes are exceedingly short, thus the foliage is very much crowded, and resembles a rosette. Consequently *Dionaea* is not acaulescent as described by Gray, Bentham and Hooker and several other authors. By the development of a distinct primary root, though of short duration, *Dionaea* differs from most of the other *Drosophyllum*.

Cimicifuga racemosa Nutt. forms a transition from this group to the next. (III.) The first stage of the seedling agrees entirely with that of *Ranunculus abortivus* (Fig. 17), but only the basal part of the hypocotyl and the primary root dies off. The upper part of the hypocotyl persists, and the stage of the first hibernation shows the slightly swollen, upper part of the hypocotyl, two secondary roots, and an apical bud, covered by two small scale-leaves (Fig. 28). The secondary roots, a part of the hypocotyl and the bud thus constitute the early perennial habit of the species.

III.—THE HYPOCOTYL.

The tuber in *Collinsonia Canadensis* L., in *Arisaema triphyllum* (L.) Schott, and the creeping, thick rhizome in *Sanguinaria Canadensis* L. and *Dioscorea villosa* L. may be traced already at the seedling-stage. Characteristic of *Collinsonia* is the germination with the cotyledons hypogaeic; in this respect it agrees with *Melittis* (Irmisch), but these two genera are the only *Labiatae*, known so far, in which the cotyledons are hypogaeic. In *Collinsonia* the hypocotyl is at first not thicker than the epicotyl, but towards the end of the first season it begins to increase in thickness so as to form a round, tuberous body (Fig. 21), with the primary root soon fading away. The primary root is very slender, and becomes replaced by two long, secondary roots, developed beneath the cotyledons, but in some distance from these. Already during the first season the seedling thus shows a tuberous stem, and the cotyledonary buds are readily visible with the base distinctly swollen; a small, vegetative shoot appears in the first season, but the first stage of hibernation is only represented by the tuber with the buds and the secondary roots. The first rejuvenation consists in the cotyledonary buds developing into aerial, mostly vegetative shoots, of which the basal, scale leaves subtend buds of the same structure and growth as the cotyledonary. In the mature plant the tuber shows many knotty protuberances caused by the shortness of the basal stem-internodes and their very considerable growth in thickness. Mature tubers vary much in size; the largest we have found measured seven cm. in length and one and a half cm. in width; they are always provided with numerous strong, though slender secondary roots, which push out from the lower face and the sides of the tuber. Mostly a single, aerial shoot develops from each tuber, but the plant is polycarpous. *Scrophularia nodosa* L. shows a similar structure according to Wydler, but in this plant the epicotyl takes also part in the formation of the tuber.

In *Arisaema triphyllum* (Fig. 22) the primary root is quite long while the plumule is still enclosed by the sheath of the cotyledon, and the hypocotyl is also distinct as shown

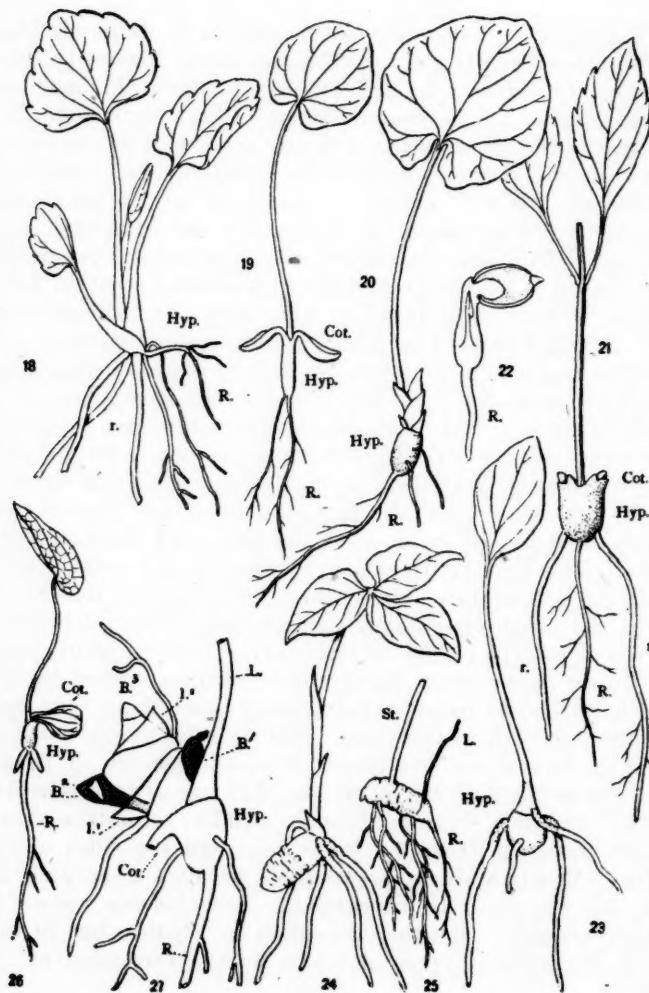


PLATE 3.

PLATE 3.

Figure 18. Same species. An older seedling, showing the withered primary root and hypocotyl; letters as above. $3 \times$ natural size.

Figure 19. *Sanguinaria Canadensis* L. Germination; letters as above; natural size.

Figure 20. Same species. Rejuvenation. A plant in its second year; letters as above natural size.

Figure 21. *Collinsonia Canadensis* L. A seedling at the autumnal stage. Cot. = the cotyledonary buds; other letters as above; natural size.

Figure 22. *Arisaema triphyllum* (L) Schott. Germination. Longitudinal section of a seedling with the cotyledon enclosed by the seed; R. = the primary root; $4 \times$ natural size.

Figure 23. Same species. A seedling at the end of the first season, showing the first green leaf, the tuberous hypocotyl (Hyp.) and four secondary roots; $4 \times$ natural size.

Figure 24. Same species. Rejuvenation; a specimen in its third year, showing the tuberous rhizome with four secondary roots, three membranaceous, scale-like leaves, and one aerial, green; $4 \times$ natural size.

Figure 25. *Dioscorea villosa* L. A young plant in its second year; L = the withered petiole of the first year; St. = the base of the first aerial stem (St.); natural size.

Figure 26. Same species. Germination. The seed has been removed to show the cotyledon; letters as above; natural size.

Figure 27. Same species. Schematic drawing of a seedling at the close of the first season; for explanation see text; enlarged.

in this figure, which represents a longitudinal section of the seedling. But so soon as the first green leaf has unfolded its ovate blade, the cotyledon and the primary root wither and drop off; at this stage the hypocotyl has developed into a round tuber, with four secondary roots (Fig. 23). During the first season no other leaves develop, and it is thus characteristic of *Arisaema*, and also of *Pinellia*, that no scale-leaves precede the assimilating, green one as in the case of *Arum* (Irmisch.) At the first stage of rejuvenation the tuber is still small, but the foliage consists now of two long, tubular, membranaceous leaves preceding a green with the blade ternately divided. During the second summer, however, the tuber increases in size, in length especially, thus the secondary rejuvenation shows us (Fig. 24) a tuber consist-

ing of two swollen internodes, the basal being the hypocotyl, and with a new set of secondary roots around the apex of the tuber, which is now terminated by a purely vegetative shoot with three tubular, and one green leaf of the typical shape, ternately divided. The ramification of the shoot is monopodial until the first inflorescence appears, and at this stage there are generally two green leaves with ample blades; of these the basal subtends a bud, which continues the growth of the individual; some few additional buds may also be observed upon the tuber, and these are developed in the axils of the tubular leaves from the preceding season, and most frequently they remain dormant.

Sanguinaria Canadensis has a relatively long, stout, horizontally creeping rhizome, originating from the hypocotyl and the plumule. The cotyledons are hypogaeic, the hypocotyl erect, and somewhat swollen; the primary root is slender, and often accompanied by a secondary of about the same length. Only one green leaf appears during the first season (Fig. 19), and the blade is entire, not palmately lobed as in the leaves of the mature plant. At the first rejuvenation the primary root still persists, and the hypocotyl has now developed into an oblong tuber with several scattered secondary roots. The foliage now consists of five scale leaves, exactly alternate, which surround the base of a long-petiolate, green leaf, with the blade broadly cordate or reniform. The shoot remains purely vegetative for several years, and only one green leaf and some few scale-like are developed each year. In mature specimens the single flower is subtended by a large, more or less deeply lobed leaf, (Fig. 41.), while the lateral shoots of the rhizome begin with the same type of leaf as observed in the seedlings.

A much faster development of a typical rhizome with several lateral buds and secondary roots is exhibited by *Dioscorea villosa*. At the first stage of the germination (Fig. 26) the primary root is not very long, and only sparingly branched, the hypocotyl is erect, and two secondary roots proceed from its basal portion. The cotyledon remains enclosed within the seed, and only one green leaf appears during the first season. In the course of the first summer the hypocotyl increases considerably in thickness, besides that the

plumule develops several internodes with scale-leaves. The first hibernation is thus marked by a typical small rhizome showing the structure as follows (Fig. 27): The primary and the two secondary roots persist; the hypocotyl is quite thick, but the seed with the cotyledon has fallen off. The green leaf has withered, and a small bud is now visible in its axil (B'); the primary axis shows now three distinct, thick internodes with scale-leaves of which the basal (I') subtends a bud (B'), partly fused together with the internode above. The apex of the axis bears a scale-like, barren leaf and a terminal bud (B'); a secondary root proceeds from the base of each of the scale-leaves. In other words the somewhat complicated branching of the rhizome is already shown at the first stage of hibernation. The first rejuvenation (Fig. 25) shows the primary root in a withered condition, while the rhizome has now increased in length, occupying a horizontal position, and provided with several secondary roots. The withered petiole of the first green leaf is still attached to the rhizome, and a short stem has developed with a single green leaf and a terminal bud, which does not grow any further, however. If we compare the stage of rejuvenation with that of hibernation (Fig. 27), the function of the buds may be readily understood. The bud B' develops as a small tuber, which remains subterranean, forming sometimes a lateral branch of the rhizome, or it stays dormant. The terminal bud B', on the other hand develops into an aerial shoot, while B' stays under ground, continuing the horizontal growth of the rhizome. This structure thus illustrates a typical sympodium, and at a remarkably early stage of the development of the plant: the first rejuvenation. When the rhizome grows older, and the first floral shoot appears the position of the various buds becomes obscured completely on account of the somewhat irregular growth of the internodes, resulting in a partial displacement of the buds.

While thus the hypocotyl is the first part of the plant to increase in thickness in the species mentioned above, the further growth of the primary axis results in the formation of very different types of subterranean stems: roundish tubers or long, horizontally creeping rhizomes; but a feature common to these plants is the early fading of the primary root,

and a corresponding early development of a secondary root-system. Tubers of the same primary structure are also characteristic of *Cyclamen*, *Umbilicus*, *Eranthis*, and certain species of *Corydalis*.

IV.—BUDS IN THE AXILS OF THE COTYLEDONS.

This structure is very frequent and characteristic of several families, seldom of certain species only. The further development of these buds is different however. They may grow out as tuberous stems (*Triadenum*, *Cunila*), as long slender stolons terminated by tubers (*Labiateae*) or as aerial shoots, sometimes replacing the primary (many *Leguminosae*.) In *Cunila Mariana* the first hibernating stage (Fig. 29) shows one of the cotyledonary buds developed into an ascending, subterranean shoot with thick internodes and small, opposite, membranaceous leaves; in mature specimens several shoots of this structure appear at the base of the stem, and during the following spring they grow out as aerial flower-bearing shoots. A very characteristic structure is exhibited by *Triadenum Virginicum*. The seedling has epigeic cotyledons, and a short hypocotyl; it reaches the flowering stage commonly in the first summer, ripening the seeds late in the fall, while the main axis dies off during the winter. Nevertheless the plant is perennial, for during the flowering period the basal part of the stem has begun to ramify, showing one to two pairs of horizontal branches, stolons, developed from the axils of the cotyledons and the subsequent pair of leaves. The former, the cotyledonary, have thick, short internodes and small scale-like, membranaceous leaves; they ramify freely (Fig. 30), but are rootless for several months; their color varies from crimson to yellowish brown. The other stolons, which develop from the axils of the leaves above, are slender, and as a rule they do not ramify. The first rejuvenation is marked by the stolons producing aerial, vegetative or floral shoots, and that secondary roots have now developed at the nodes of the stolons, or more correctly just above the nodes. While the aerial shoots die off during the fall, the remaining part of the tuberous stolon is able to continue its ramification for at least another year.

We have thus in *Cunila* a perennial herb with a pseudorhizome, and of which the rejuvenation is effected by means

of the lateral shoots with the basal internodes fleshy, and covered with scale-leaves, as shown at the stage of hibernation. In *Triadenum*, on the other hand, the mother plant persists only for one or two years, while the stolons may continue their growth for a longer period, branching and producing many aerial shoots (Fig. 31). *Glaux maritima* L. shows a very singular structure according to Buchenau. The cotyledons are epigeic, and the primary shoot does not ramify; it dies down to the ground during the first season leaving only a cotyledonary bud provided with a storage-root to hibernate. The first rejuvenation thus depends upon the development of this bud into a small, aerial, leafy shoot, rooting at the nodes; horizontally creeping stolons develop from the basal leaves of this shoot, and the leaves of the stolons subtend buds for the next year. These buds are also provided with storage roots, and likewise the cotyledonary, they are the only parts of the plant that hibernate, the leafy shoots as well as the stolons themselves dying off at the close of the first season.

The cotyledonary bud in *Glaux* thus persists as a bud with a large root during the hibernation, and constitutes the only part of the seedling left active at that stage.

In many of the other herbs, of which the cotyledons subtend buds, these may develop into runners or stolons, the latter remaining slender in their entire length or becoming terminated by tubers or bulbs. In such plants the hibernation is often marked by the persisting stolon, or by its apex alone, when terminated by a tuber or bulb. In *Lycopus Virginicus* L. the stolons are tuberiferous, but slender in *L. Europaeus* L.; in *Scutellaria lateriflora* L., *S. galericulata* L., *S. California* Gr. the stolons are slender, but tuberiferous in *S. parvula* Rich., *S. tuberosa* Benth. etc. Many other examples (European) are mentioned by Irmisch, Warming and some other authors. In these plants the rejuvenation thus depends upon the formation of an aerial shoot from the apex of the stolon.

A stronger vitality of the primary shoot, or let us say the seedling, is exhibited by some plants, in which the cotyledonary buds develop into runners. For instance, *Glechoma hederacea* as described by Irmisch does not only develop

runners of considerable length, but the primary shoot becomes also prostrate, and runners are developed from the axils of many of the caudine leaves, of the same structure as the cotyledonary.

There is also a number of herbs, but of erect habit, in which the cotyledonary buds directly develop into aerial shoots with the basal internodes persisting, and contributing to the formation of a pseudo-rhizome. This type is apparently common in the *Leguminosae*, and not infrequently the cotyledonary shoots replace the primary. In *Baptisia tinctoria* R. Br., for instance, (Fig. 32), the seedling shows in the first season the epigeic, cotyledons borne upon an erect, selen-

PLATE 4.

Figure 28. *Cimicifuga Canadensis* Nutt. The first hibernation, showing the apical bud, the partly faded hypocotyl and primary root; two strong secondary roots have developed from the primary shoot; $2 \times$ natural size.

Figure 29. *Cunila Mariana* L. Hibernation; a tuberous, subterranean shoot has developed from the axil of one of the cotyledons; St. = base of the aerial shoot; $5 \times$ natural size.

Figure 30. *Triadenium Virginicum* (L.) Rafin. Hibernation. Tuberous, cotyledonary shoots have been developed. R = the primary root; natural size.

Figure 31. Same species. Rejuvenation. A branch of the rhizome developing into an aerial shoot; the secondary roots proceed from the axils of the scale-like leaves, and a small stolon is about to develop; two-thirds of the natural size.

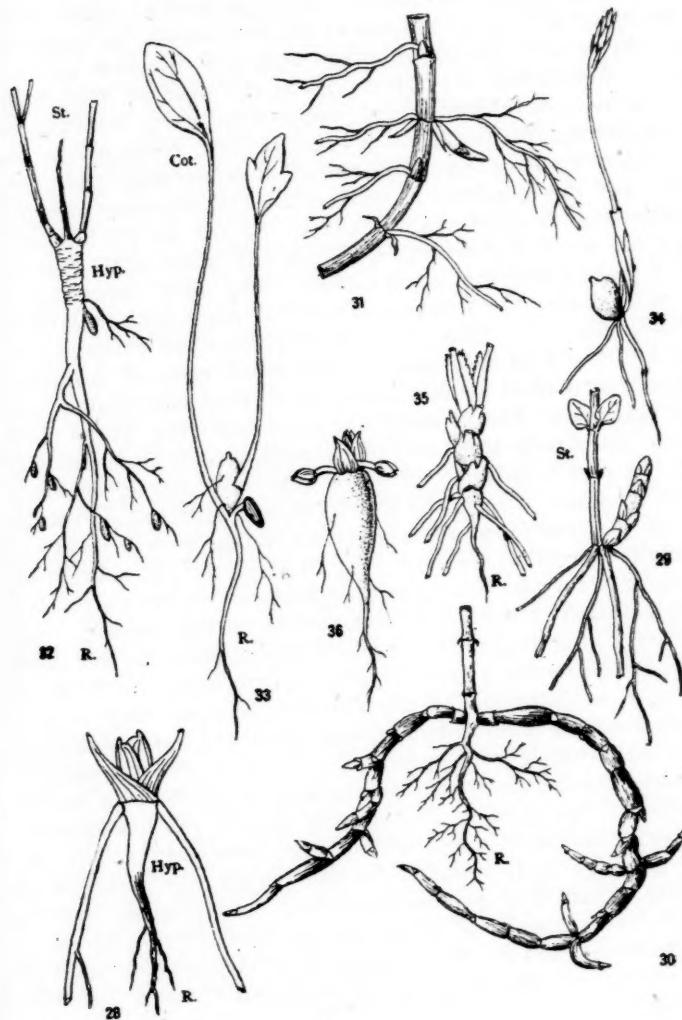
Figure 32. *Baptisia tinctoria* R. Br. Rejuvenation. A plant in its second year, showing the withered, primary shoot (St.), and two cotyledonary shoots, the hypocotyl (Hyp.), and the persisting, primary root (R.) with tubercles; natural size.

Figure 33. *Dentaria laciniata* Muehl. Germination. The plumule has developed into a small tuber, bearing a green leaf; letters as above; $3 \times$ natural size.

Figure 34. *Dicentra Cucullaria* (L.) Bernh. Rejuvenation. A young plant developed from a bud in the axil of a fleshy, scale-like leaf of the rhizome; $3 \times$ natural size.

Figure 35. *Viola papilionacea* Pursh. Rejuvenation. The rhizome of a plant in its second year with the primary root still visible; $2 \times$ natural size.

Figure 36. *Oxalis violacea* L. Rejuvenation. A bulb with two young stolons and a large storage-root; natural size.



der hypocotyl, and the primary root is quite long, and bears several tubercles; the plumule develops into an erect, leafy shoot, but dies off at the end of the first season, leaving only the hypocotyl, the cotyledonary buds and the root still active. Meanwhile the hypocotyl and the primary root begin to increase in thickness, and become contractile, drawing the buds down into the ground. By the first rejuvenation the buds grow out as vegetative shoots, thus replacing the primary, and the hypocotyl as well as the root continue to grow, increasing gradually in thickness. So far as we have observed, the first flowering does not take place until four or five years after the germination. The first rejuvenation thus indicates the future habit of the plant with regard to the rhizome. In fully matured specimens the rhizome consists of the hypocotyl and the persisting bases of the aerial shoots with their small tubular, membranaceous leaves subtending buds. The primary root persists so long as the plant lives, and strong, thick secondary roots develop from the base of the pseudo-rhizome. It is a type of rhizome, which is very frequent among the *Papilionaceae* with epigeic cotyledons. As mentioned above a corresponding growth recurs in certain species of *Melilotus*, but in these the individual persists only for two years; in *Strophostyles* we have seen that the duration is one year longer owing to the primary root-system remaining active and producing shoots in the third year. *Chenopodium ambrosioides* L. germinates in the same manner as *Baptisia*, but the plumule develops into a tall, flower-bearing stem during the first season; the hibernation and rejuvenation correspond with *Baptisia*, and the subterranean stem represents a pseudo-rhizome. In *Phryma leptostachya* L. the primary root dies off during the first season, becoming replaced by several strong, secondary roots; the cotyledonary buds remain dormant until the succeeding spring, when they develop into erect, aerial shoots, purely vegetative. The basal internodes of these persist, increase in thickness, and by the continuous development of buds in the axils of the basal leaves a pseudo-rhizome becomes formed.

The occurrence of cotyledonary buds in the Monocotyledones appears to be very rare. In *Maianthemum bifolium*

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(L.) F. W. Schmidt Raunkiaer observed a typical stolon developed from the axil of the cotyledon (fide Warming 1918, p. 320), and in *Similax rotundifolia* L. we have also observed a cotyledonary bud, which developed into a tuber of three internodes, or into a vegetative shoot, but both with the first leaf representing an adorsed prophyllon.

The function of the cotyledonary buds to produce shoots, and these being of great importance to the vegetative reproduction, is as we have seen, sometimes connected with the very early death of the mother-plant, the seedling; the seedling may even die without having reached the flowering stage. The multiplication of the individual thus embodies the destruction of the mother-shoot, nevertheless such plants are referred to the group: perennials. It would be difficult to classify them in any other manner, even if the new, independent individuals are subject to the same conditions as the original, the seedling. In certain typically annual plants the cotyledonary buds sometimes remain dormant until late in the summer or the fall, when they suddenly grow out as leafy shoots, but aerial, not subterranean; they may hibernate, and produce flowering stems in the succeeding spring, without becoming detached from the mother-plant: the hypocotyl and the root. In other words, these annuals follow, so to speak, the example of *Melilotus* and *Strophostyles* by their vegetative reproduction being above ground. In no instances have we observed such annuals tending to become perennial by means of subterranean structures.

Warming, in his very instructive work on shoot-structure (1884), expressed the opinion that perennial species, which are closely related to annuals, are often stoloniferous, the cotyledonary buds developing into subterranean shoots; he mentions as an example the perennial *Oxalis stricta* L., as compared with the annual *O. corniculata* L. According to our experience there are too many exceptions for considering this suggestion applicable in general. Some few examples may be mentioned. *Arabis lyrata* L. varies from annual to biennial or even perennial; the last form has a persistent primary root, crowned by many rosettes of leaves, subtending the floral shoots. This species as well as *A. dentata* T. et G. belongs to the section *Sisymbrina* Wats., but the habit of *A. dentata*

is quite different; it is a perennial, but has only one rosette of leaves, subtending the ascending flowering stems, and the structure of the shoot is monopodial. In the section *Kneiffia* of *Oenothera* we have the annual, or occasionally biennial, *O. linifolia* Nutt., while all the other species of the section are perennial, and none being stoloniferous. Furthermore the nearest allies of the annual *Polygonum Hydropiper* L.: *P. acre* H. B. K., *P. setaceum* Baldw., and *P. hydropiperoides* Michx., are perennial, but only by the stems being decumbent, and rooting. The annual *Erigeron annuus* (L.) Pers. and *E. strigosus* Muehl. as compared with the perennial *E. bellidifolius* Muehl. with its leafy, prostrate shoots are also a good illustration of a perennial habit being effected by aerial structures instead of by subterranean "stolons," although the species allied are annuals.

V.—THE PLUMULE.

It seems to be very seldom that the plumule itself indicates the future perennial habit; such is the case, however, of *Dentaria laciniata* (Fig. 33.) There is no hypocotyl, and only one of the cotyledons appears above ground, the other remaining enclosed within the seed. As shown in the figure the plumule has developed into a small, oblong, erect tuber, bearing a long-petioled, green leaf, the first succeeding the cotyledons. Very thin, secondary roots become developed from the tuber, and the primary root fades away during the first season. The tuber shows exactly the shape of the future rhizome, that is to say of one year's growth, and it gradually changes its direction from vertical to horizontal. It is interesting to notice that in the European *D. bulbifera* L. the plumule develops in the shape of a bulblet, resembling the bulblets borne in the axils of the upper stem-leaves. As described by Warming the rhizome of *D. bulbifera* shows the unusual structure of the scale leaves being very thick, rich in nutritive substances, as are also the internodes to some extent. The same structure recurs in our *D. diphylla* Michx., but we have not had the opportunity to study the seedling-stage of this species.

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Viola papilionacea Pursh (Fig. 35), and several of the other acaulescent species show a similar structure of the rhizome and it begins already at the seedling-stage. The hypocotyl increases in thickness, and the plumule develops several green leaves, which wither during the summer, but leaving the bases of the petioles and stipules intact; as a matter of fact the primary axis represents at the first hibernation a small, erect rhizome with the swollen bases of the leaves. These persistent bases of the petioles and stipules contain large deposits of starch, as do also the short internodes. The mature rhizomes of these *Violae* are horizontal, and they resemble very much those of *Dentaria bulbifera* and *D. diphylla*, thus representing a combination of a bulb and a rhizome. In *Viola bulbosa* Maxim. from the Himalayas the subterranean stem is described as a true bulb.

The peculiar seedling of *Podophyllum peltatum* L. may be mentioned here. The cotyledons have long petioles, which are united to their full length so as to form a cylindrical, hollow tube. The very small plumule is located at the base of this tube, and does not grow any further during the first season. The primary root is long and branches freely, but no hypocotyl is developed. The plumule and the root hibernate, the cotyledons having withered during the fall. At the first rejuvenation we notice that the plumule has developed into an exceedingly short axis (vertical), bearing three membranaceous, scale-like, and one aerial, green leaf with the blade peltate. This structure is also to be seen, when the plant is in its third year, besides that two secondary roots have developed from the nodi of the previous year's growth. It is not until the plant has reached an age of four or five years that the direction of the rhizome becomes changed from vertical to horizontal. This type of germination, with the plumule inclosed in the tubular sheath of the petioles is known also from several other plants. Among the *Berberideae* themselves, *Leontice Altaica* and *L. vesicaria* show a similar structure according to Bernhardi; a larger number of cases have been observed in the *Ranunculaceae* viz., species of *Anemone*, *Ranunculus*, *Delphinium*, *Aconitum*, and *Eranthis*; in the *Umbelliferae*, viz. species of *Ferulago*, *Prangos*, *Smyrnium*, *Bunium*, and *Chaerophyllum bulbosum*;

furthermore in *Megarrhiza Californica*, *Rheum Moortcroftianum*, *Polygonum Bistorta*, *P. viviparum*, and *Dodecatheon Meadia*. With the exceptions, however, of *Eranthis*, *Aconitum* and *Ranunculus* the plumule develops during the first year, breaking through the base of the tube.

Finally in *Dicentra Cucullaria* (L.) Bernh. the seedling-stage having been described by Irmisch, only one of the cotyledons is developed; this has a small, tripartite blade, and the swollen base of the petiole surrounds the plumule with a few membranaceous scale-leaves. During the first season the cotyledon withers, and the hibernating stage becomes thus represented by a small, tuberous body, the base of the petiole, and the minute bud. At the time of rejuvenation (Fig. 34) a green leaf appears, surrounded at the base by the membranaceous leaves, and with the tuber still attached. In other words the first rejuvenation gives us an exact illustration, though in a smaller scale, of the habit of the mature plant. The subterranean stem with its foliage represents a structure intermediate between a bulb and a rhizome. It is of a globular or ovoid shape, and consists of a much ramified axis with the branches very short and densely covered by fleshy, scale-leaves of a light rose color; these scale-leaves show on their ventral face a small cavity enclosing a minute bud, surrounded by thin, membranaceous scales. In the course of the summer, when all the aerial leaves and floral stems have withered, the small, fleshy leaves drop off, and with their buds enclosed they develop new individuals in the succeeding spring. The rhizome, however, bears also some large buds, terminating the axis, which at the time of rejuvenation give rise to several green leaves and a terminal flowering stem. We have thus in *Dentaria*, *Viola* and *Dicentra* some examples of a very rare structure, where a tuber, a bulb or a bulb-like rhizome appear as primary structures, owing their development to the plumule or even to the cotyledon alone as in *Dicentra*.

VI.—BUDS UPON THE LATERAL ROOTS.

Root-shoots are known from several herbs, but we know of only one genus, *Rhexia*, where they appear already at the seedling stage. In *Rhexia Virginica* L. the seedling does not reach the flowering stage, and dies off in the course of the first summer, leaving only one or two lateral roots still active. These roots increase in thickness, forming small tuberous bodies, which hibernate, and produce aerial shoots in the succeeding spring. *Rhexia Mariana* L. multiplies in the same manner, but the roots remain slender, increasing considerably in length, however, and produce many aerial shoots. The simplest type of hibernation, is thus exhibited by *Rhexia*: a lateral root with some buds.

These are the principal methods by which the perennial habit becomes effected, to be traced already from the seedling-stage. The first hibernation and rejuvenation frequently indicate, how the final habit of the plant will be, and especially with regard to the subterranean organs. The secondary root system and the cotyledonary buds play a rôle of great importance in the Dicotyledones. But even if this root-system substitutes the primary root completely, and at a very early stage in the Monocotyledones, the structure of the primary shoot seldom becomes influenced in these so as to show any particular modification; the final habit of the Monocotyledones is very seldom indicated at the seedling stage.

By examining these six types of hibernation and rejuvenation, described in the preceding, it is interesting to notice how the same type may be exemplified by very different families, and that species, otherwise closely related, may be very distinct in this respect. As a matter of fact the seedling stage alone may, in some instances, be quite different: germination with only one cotyledon; the cotyledons being hypogaeic or epigeic; the primary root being a storage-root from the very beginning; the hypocotyl being well represented or not developed at all, etc. These various structures, however, are still more conspicuous, when we examine the mature plants at their stage of hibernation and rejuvenation. Nevertheless the rejuvenation will prove to some extent, to be a repeti-

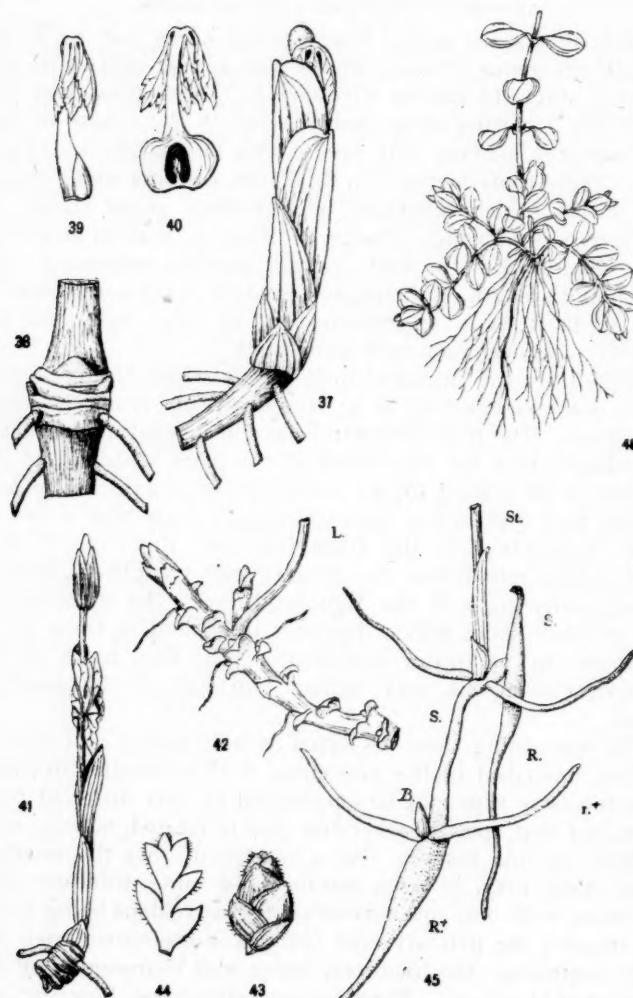


PLATE 5.

PLATE 5.

Figure 37. *Podophyllum peltatum* L. Rejuvenation. Apex of the rhizome of a mature specimen, showing the scale-leaves surrounding the flower-bearing stem; two thirds of the natural size.

Figure 38. Same species. Apex of the rhizome of a mature specimen, seen from below; the scale-leaves have been removed to show the buds; the largest bud at the base of the stem is terminal, but remains dormant. One of the two swollen buds will continue the growth of the rhizome; two thirds of the natural size.

Figure 39. Same species. Rejuvenation; one of the two green leaves; enlarged.

Figure 40. Same leaf with the base laid open to show the other green leaf enlarged.

Figure 41. *Sanguinaria Canadensis* L. Rejuvenation, showing the erect flowerbud, the green leaf, and the scale-leaves, besides the apex of the rhizome; two thirds of the natural size.

Figure 42. *Dentaria diphylla* Michx. Rejuvenation; The rhizome with a green leaf (L.) subtending a branch; two thirds of the natural size.

Figure 43. *Lithophragma tenella* Nutt.; one of the bulbs from the base of the stem; enlarged.

Figure 44. Same bulb, longitudinal section; enlarged.

Figure 45. *Platanthera clavellata* Michx. Hibernation. St. = the base of the floral shoot with the old rhizome (S.) and roots (R. and r.) S*, R* and r* are the corresponding rhizome and roots, B = the hibernating bud; two thirds of the natural size.

Figure 46. *Hypericum muticum* L. Base of a mature specimen with several aerial shoots to hibernate; natural size.

tion of the younger stage, the advanced growth of the seedling preparing for the first hibernation. But in the mature plants the development of floral shoots and the necessary increase of foliage require some modifications to take place in the subterranean and aerial structures. We shall now describe some rhizomes of more or less complicated composition, ramified or of a very condensed growth; tubers and bulbs; stolons and runners; further increase in the root-system, and the development of buds of different form and variously situated.

The term "rhizome" is often applied to any subterranean stem including stolons, etc., and it is really a difficult matter to give any precise definition of a structure so polymorphous as the subterranean stem, even if we exclude stolons and

similar shoots, which do not belong to the subterranean stem s. s. It is often necessary to have studied the germination, and naturally the further growth of the plumule during the first one or two years in order to ascertain the exact nature of certain subterranean stems, whether they represent the primary axis or axes of secondary order; the axes of secondary order, cotyledonary shoots for instance, are stolons, when subterranean, runners, when aerial. The rhizome itself, depends undoubtedly, in most cases, upon the gradual development of the plumule into a subterranean, horizontal or vertical stem with sympodial or monopodial ramification. But the question of characterizing the "rhizome" in a comprehensive manner so as to include all the types existing, is hardly possible. Some few years ago (1918) the suggestion was made by Warming to restrict the term rhizome to "horizontal (plagiotropic) subterranean stems with short, generally thick internodes, rich in nutritive matters, and frequently with only a few, thin roots" (*Anemone nemorosa*, *Polygonatum*, *Scrophularia nodosa*, *Dentaria bulbifera*). On the other hand, a new term "rhizode," suggested by the same author, should be used for "horizontal subterranean stems, which are not thick like the rhizomes, but thin and with the internodes stretched, thus resembling stolons." (*Hippuris vulgaris*, *Paris*, *Carex arenaria*, *Scripus lacuster*, etc.) Furthermore the term "mesocormus" should apply to the vertical subterranean stems of *Primula*, *Plantago major*, *Sedum telephium* and numerous others. Regarding the axillary shoots Warming (l.c.) proposed the term "stolons" for the aerial, and "suboles" for the subterranean. The term "mesocormus" became substituted for "pseudo-rhizome" (Hj. Nilsson), although some of the examples mentioned: *Primula* and *Plantago major* are by Nilsson included under "rhizome s.s." The material studied by Warming, was principally of Scandinavian origin, a fact that might explain the somewhat narrow definition of "rhizome," besides the misleading "rhizode." As indicated above, it would be a very difficult matter to define "rhizome" as a typical and constant stem-structure, and the segregation of the more slender forms as "rhizodes" would not seem feasible, when we deal with North American plants. For instance the horizontal, subterranean stem, developed

from the plumule itself in *Podophyllum* could not be included under "rhizome," since it consists of a series of slender, stretched internodes alternating with short, and thickened, besides that the roots are relatively thick, and strong. Moreover in *Iris cristata* and its allies, in *Medeola* and several others the structure is not identical throughout. The subterranean stem of *Aplectrum* with tubers alternating with long, slender internodes, could not possibly be termed a rhizome according to the definition given by Warming. Nevertheless these and several other types of subterranean stems do represent rhizomes, and consequently we prefer to consider them as such. Rhizomes are furthermore the subterranean stems of *Tipularia*, of *Corallorrhiza*, some of the acaulescent species of *Viola*, *Dentaria* (all the species), as well as the vertical of *Trillium*, *Uvularia*, *Plantago*, beside the descending in *Orchis*, *Platanthera*, etc. The term pseudo-rhizome is, according to our opinion, so well defined by Hj. Nilsson, that we see no reason why it should be changed to "mesocormus." The aerial, axillary, prostrate stems have since long been called runners, whether they bear leaves (*Glechoma*, *Antennaria*) or are leafless (*Saxifraga flagellaris*), but terminated by a rosette of leaves. The corresponding, but subterranean are called "stolons," whether slender in their entire length (*Oakesia*, *Viola primulifolia*), or terminated by tubers (many *Labiatae*, *Trientalis*, *Cynthia*, *Cyperus phymatodes* etc.), or bulbs (*Erythronium*, *Claytonia Chamissonis*, *Oxalis violacea*, etc.) Finally we wish to point out that there are some types of rhizomes, which must be characterized a little more precisely than simply as rhizomes, for instance the coraloid, profusely branched in *Corallorrhiza*, and the similar, but additional in *Aplectrum*; the shoots in *Lithophragma* (Figs. 43, 44) resemble bulbs, but the fleshy scales are borne upon a distinct horizontal axis, a structure that occasionally recurs in *Lilium superbum*. In *Hydrophyllum Canadense*, as already described by Alexander Braun, the horizontal rhizome bears several fleshy scales, preceding the aerial leaves, thus representing a transition between bulb and rhizome; the acaulescent *Viola papilionacea* and its allies, besides *Dentaria diphylla* (Fig. 42) possess similar bulb-like rhizomes. Some certain rhizomes are very much

ramified as for instance in *Comandra*, thus the branches may be mistaken for stolons, but it is always characteristic of stolons, that their external structure, length and thickness of internodes, is quite distinct from that of the axis that bears them, readily to be seen in *Triadenum*, many *Labiateae*, *Claytonia Chamissonis*, etc., in which the stolons are more or less tuberous, or very slender.

In passing to describe the hibernation and rejuvenation as exhibited by the mature plants, we do not attempt to suggest any classification of the various types, nor will it be possible to follow the same arrangement as we have done with reference to the seedlings and their subsequent growth during the first and second year. For even if the youngest stages of many plants may indicate the future habit, the mature root-system as well as the stems under ground show many modifications, naturally to be expected. By studying the seedling-stage we have learned how the perennial habit is effected, the principal means being the root-system, the hypocotyl, the plumule and the cotyledonary buds. In the mature plants, however, the subterranean organs have become developed still further, not only for securing the perennial habit in the manner of vegetative reproduction, but in many cases, also for securing the distribution over a larger area, not speaking of the most important, the storing of nutritive matters. Of these structures the horizontally creeping rhizomes represent undoubtedly the most important. Their development is relatively slow; they do not produce floral shoots before several years after the germination, but they may persist for many years in an active condition. In these particular points the rhizomes thus differ from the stolons.

A very interesting type of rhizome is represented by *Podophyllum peltatum* L. We have seen, that the plumule of the seedling hibernates as a bud, and that the first stage of rejuvenation shows three scale-leaves preceding an aerial, with petiole and leaf-blade. The beginning of the rhizome consists of a few, very short internodes, forming an erect axis, but when the plant has reached the age of four or five years, a lateral bud appears and grows out as a horizontal shoot. The mature rhizome may be of a very considerable

length growth short, with the former which terrane leaves (Fig. 1) other two leaves will be leaves tion is (Fig. 2) axil of summeration as parts of son, and the position the rhizome in the this plant vegetat develop the other habit of the sympod the same well ex The rhizome exactly the we have the root several erect in age-root with de

length representing the growth of several years, and the growth of each year depends upon the development of a short, erect shoot of several internodes, and of a horizontal with the internodes long, and not so thick as those of the former. At the apex of the horizontal branch is a large bud, which hibernates. If we examine this bud, while still subterranean and perfectly closed, we find inside the scale-leaves a small, but very distinct leaf with a pellate blade (Fig. 39), and with the sheathing petiole surrounding another leaf of same shape, but much smaller (Fig. 40). These two leaves, although not developed at exactly the same time, will become the foliage of the flowering stem, the two green leaves held above the single flower. The stage of rejuvenation is thus marked by the opening of the large, frontal bud (Fig. 37), besides that a bud soon becomes visible in the axil of one of the scale-leaves, which in the course of the summer grows out as a horizontal shoot, in the same direction as the main rhizome itself. These two very conspicuous parts of the rhizome thus constitute the growth of one season, and they show exactly the same minor structure as all the posterior from the years previous. The ramification of the rhizome is very complicated, and we have described this in the *Botanical Gazette* (1899). We shall only mention in this place, that the erect shoot is terminated by a dormant, vegetative bud, while the flowering stem is lateral, being developed in the axil of the innermost scale-leaf; consequently the erect shoot represents a monopodium, while, on the other hand, the continuation of the entire rhizome by means of the axillary bud (Fig. 38) makes the ramification sympodial. Such alternations of monopodia and sympodia in the same rhizome are not infrequent; they are exceedingly well exemplified by *Calypso*, *Tipularia*, *Aplectrum* and others. The rhizome branches frequently, and the branches show exactly the same external structure as the main rhizome, which we have seen originated from the plumule itself. Regarding the root-system this is well represented in *Podophyllum* by several strong, ramified roots proceeding from the short, erect internodes, just beneath the floral shoot; they are storage-roots with the cortex and pith representing large tissues with deposits of starch; the rhizome contains also starch in

abundance. Finally with regard to the flower-bud this is erect from the very earliest stage of the rejuvenation, while, as we remember, a nutation is characteristic of the Dicotyledones. In this respect *Podophyllum* agrees with *Caulophyllum*, *Jeffersonia* and *Sanguinaria*.

(To Be Continued.)

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